Southwest Florida
Water Management District

Hydrogeology, Water Quality, and Well Construction at the East Homosassa Well Site in Citrus County, Florida

Southwest Florida Water Management District
Geohydrologic Data Section

October 2020

Cover Photo: Permanent monitor wells at the East Homosassa Well Site in Citrus County, Florida in order from left to right: East Homosassa UFA Monitor and East Homosassa Saltwater Interface Monitor. Photograph by Ted Gates.

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By Kristina D. Mallams

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The hydrogeologic evaluations and interpretations contained in *Hydrogeology, Water Quality, and Well Construction at the East Homosassa Well Site in Citrus County, Florida* have been prepared by or approved by a licensed Professional Geologist in the State of Florida, in accordance with Chapter 492, Florida Statutes.

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Date: 10/26/2020

Foreword

The Geohydrologic Data Section (GEO) administers the Regional Observation and Monitor-well Program (ROMP) at the Southwest Florida Water Management District (District). The ROMP was started in 1974 in response to the need for hydrogeologic information by the District. The focus of the ROMP is to quantify the flow characteristics and water quality of the groundwater systems that serve as the primary source of water supply within southwest Florida. The original design of the ROMP consisted of an inland 10-mile grid network composed of 104 well sites and a coastal transect network composed of 57 coastal monitor transects of two to three well sites each. The number of wells at a well site varies with specific regional needs; usually two to five permanent monitor wells are constructed at each site. The numbering system for both networks generally increases from south to north with ROMP-labeled wells representing the inland grid network and TR-labeled wells representing the coastal transect network.

In addition to the ROMP, the GEO section constructs monitor wells and performs testing activities for other District programs and projects. The broad objectives at each well site are to determine the geology, hydrology, water quality, and hydraulic properties, and to install wells for long-term monitoring. Site activities include coring, testing, and well construction. These activities provide data for the hydrogeologic and groundwater quality characterization of the well sites. These characterizations are used to ensure the monitor wells are properly designed. At the completion of each well site, a summary report is generated and can be found at the District's website at www.watermatters.org/data. The monitor wells form the backbone of the District's long-term aquifer monitoring networks, which supply critical data for the District's regional models and hydrologic conditions reporting.

M. Ted Gates

Manager

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Tables

Conversion Factors and Datums

Multiply	By	To obtain
	Length	
inch (in)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	0.004047	square kilometer (km^2)
square foot (ft^2)	0.09290	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	3.785	liter (L)
gallon (gal)	0.003785	cubic meter (m^2)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
	Flow Rate	
foot per day (ft/d)	0.3048	meters per day (m/d)
cubic foot per day (ft^3/d)	0.02832	cubic meter per day (m^3/d)
gallon per day (gal/d)	0.003785	cubic meter per day (m3/d)
	Pressure	
atmosphere, standard (atm)	101.3	kilopascal (kPa)
bar	100	kilopascal (kPa)
	Temperature	
Celsius (°C)	°F = (1.8 x °C) + 32	Fahrenheit (°F)
Fahrenheit (°F)	°C = (°F – 32) / 1.8	Celsius (°C)

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Elevation, as used in this report, refers to distance above the vertical datum.

Abbreviations and Acronyms

als	above land surface
bls	below land surface
CGWQMN	Coastal Groundwater Quality Monitoring Network
Commun.	Communication
District	Southwest Florida Water Management District
EPA	Environmental Protection Agency
FGS	Florida Geological Survey
fig.	figure

Abbreviations and Acronyms continued

gpm	gallons per minute
Huss	Huss Drilling, Incorporated
HQ	3.06-inch inside diameter, 3.5-inch outside diameter core drilling rod
ID	Identification
mg/L	milligrams per Liter
µg/L	micrograms per Liter
ml	milliliter
µS/cm	microSiemens per centimeter
NAVD 88	North American Vertical Datum of 1988
ND Model	Northern District regional groundwater flow model
NDWRAP	Northern District Water Resources Assessment Project
No.	Number
PVC	polyvinyl chloride
TDS	Total Dissolved Solids
UFANMN	Upper Floridan Aquifer Nutrient Monitoring Network
WCP	well construction permit
WMIS	Water Management Information System
WQMP	Water Quality Monitoring Program

Hydrogeology, Water Quality, and Well Construction at the East Homosassa Well Site in Citrus County, Florida

By Kristina D. Mallams

Introduction

The Geohydrologic Data Section of the Southwest Florida Water Management District (District) conducted a hydrogeologic investigation and constructed two wells in Citrus County. This site is referred to as the East Homosassa well site. The East Homosassa well site is part of the Northern District Drilling Plan initiative to construct six well sites in the northern District in support of the Northern District Water Resources Assessment Project (NDWRAP) (fig. 1). The NDWRAP was initiated to assess the impacts of groundwater withdrawals, monitor the freshwater/saltwater interface, identify areas of poor groundwater quality, determine the nature of flow to major springs, supply data for minimum flow and level establishment, provide information for the District's regional groundwater flow models, and create a regional groundwater monitoring system for the northern District (Ron Basso, written commun., 2007). The northern District encompasses all of Hernando, Citrus, and Sumter Counties as well as portions of Lake, Marion, and Levy Counties (fig. 1).

The primary objectives at the East Homosassa well site were to delineate the vertical and geographic extent of the saltwater interface within the Upper Floridan aquifer and to construct wells for long-term water level and water quality monitoring. Data from this well site will help refine the groundwater flow models that are used to evaluate future water supply, and establish minimum flow and level criteria.

This well site will also support the Upper Floridan Aquifer Nutrient Monitoring Network and the Coastal Groundwater Quality Monitoring Network under the Water Quality Monitoring Program (WQMP). The Upper Floridan Aquifer Nutrient Monitoring Network is designed to track regional trends of nitrates within the Upper Floridan aquifer in the northern portion of the District. The Coastal Groundwater Quality Monitoring Network is designed to monitor the landward movement of the saltwater interface.

The East Homosassa well site was completed on March 21, 2016. This report details the well construction, lithostratigraphy, hydrostratigraphy, and water quality at the East Homosassa well site. The data collected at this well site supports the mission of the District to provide accurate, cost effective, and defensible data for use in the management and protection of the state's water resources and related natural systems.

Acknowledgments

Special thanks to Huss Drilling, Incorporated, for their continued professionalism.

Site Location

The East Homosassa well site is in southwestern Citrus County approximately ¾ mile southeast of the Homosassa River. It is in the northwest ¼ of the northwest ¼ of Section 33, Township 19 South, and Range 17 East at latitude 28° 47′ 15.00″ north and longitude 82° 35′ 45.60″ west (fig. 2). The land surface elevation is approximately 2.40 feet above the North American Vertical Datum of 1988 (NAVD 88). The East Homosassa well site is located on a perpetual easement granted by The Tampa Bay Conservancy, Incorporated.

From the District's headquarters located south of Brooksville in Hernando County, the East Homosassa well site can be found by going north on US-41 towards Spring Hill Drive, south of Brooksville in Hernando County. Head west on Spring Hill Drive for 3 miles to FL-589 Toll North. Head north on FL-589 Toll North for 14 miles and turn west onto US-98 N/W Ponce De Leon Boulevard. Continue for 4 miles and turn right onto US-19 North/US-98 North/South Suncoast Boulevard. Continue north for 5 miles and turn left onto West Bradshaw Street. Continue west on West Bradshaw Street for 0.7 miles and turn slightly left onto West Yulee Drive. After one mile, the well site will be on the north side of the road.

The East Homosassa well site is in the Northern Gulf Coastal Lowlands physiographic region of west-central Florida (White, 1970). The well site is about 1 mile to the west of the Coastal Swamps physiographic region and 4 miles to the east of the Brooksville Ridge physiographic region. The East Homosassa well site is in the Homosassa River Drainage Basin within the Homosassa Springs Group. The Homosassa Springs Group is an important hydrological feature to the area

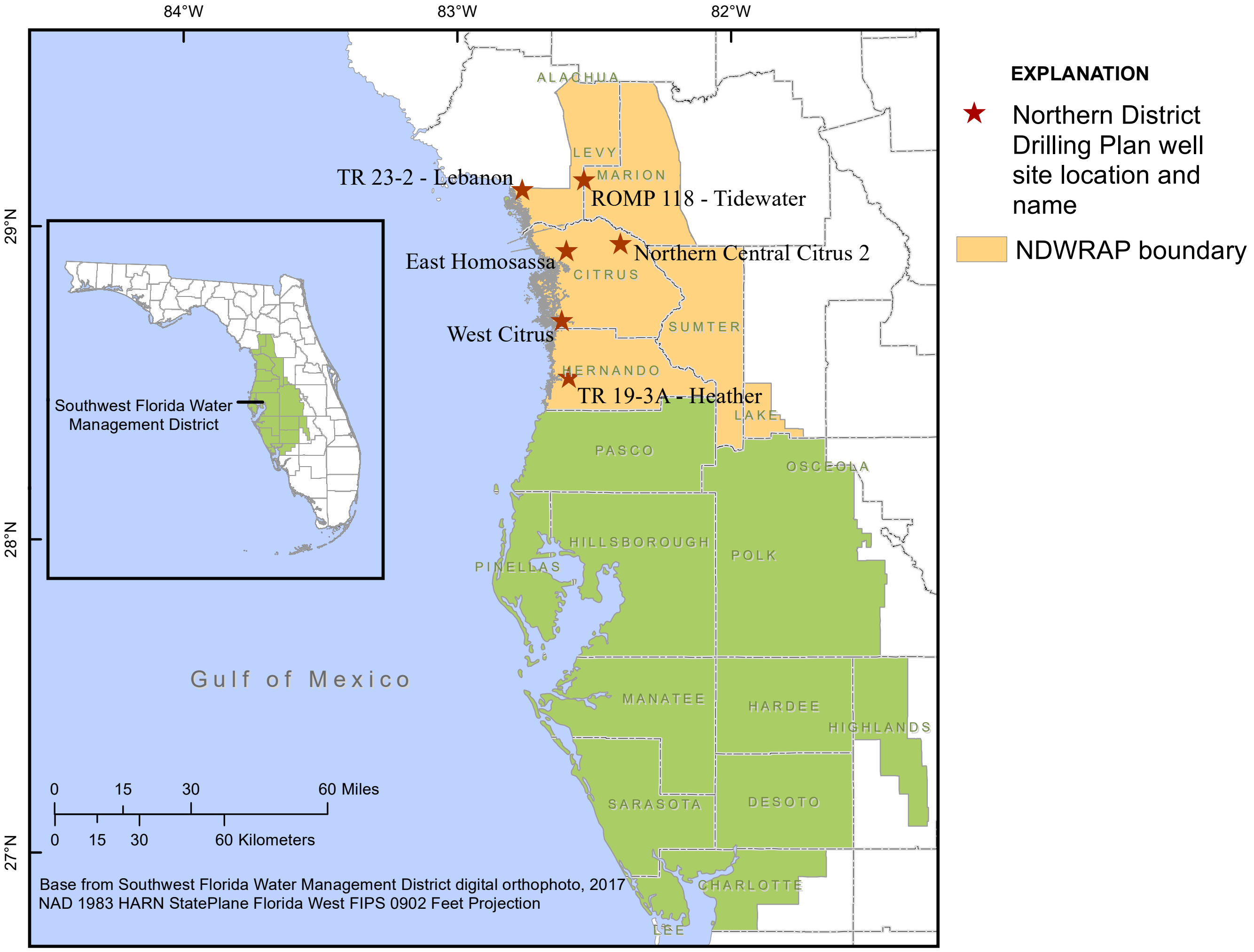


Figure 1. Northern District Drill Plan well sites with NDWRAP boundary.

as it discharges groundwater from the Upper Floridan aquifer to the headwaters of the Homosassa River.

Methods

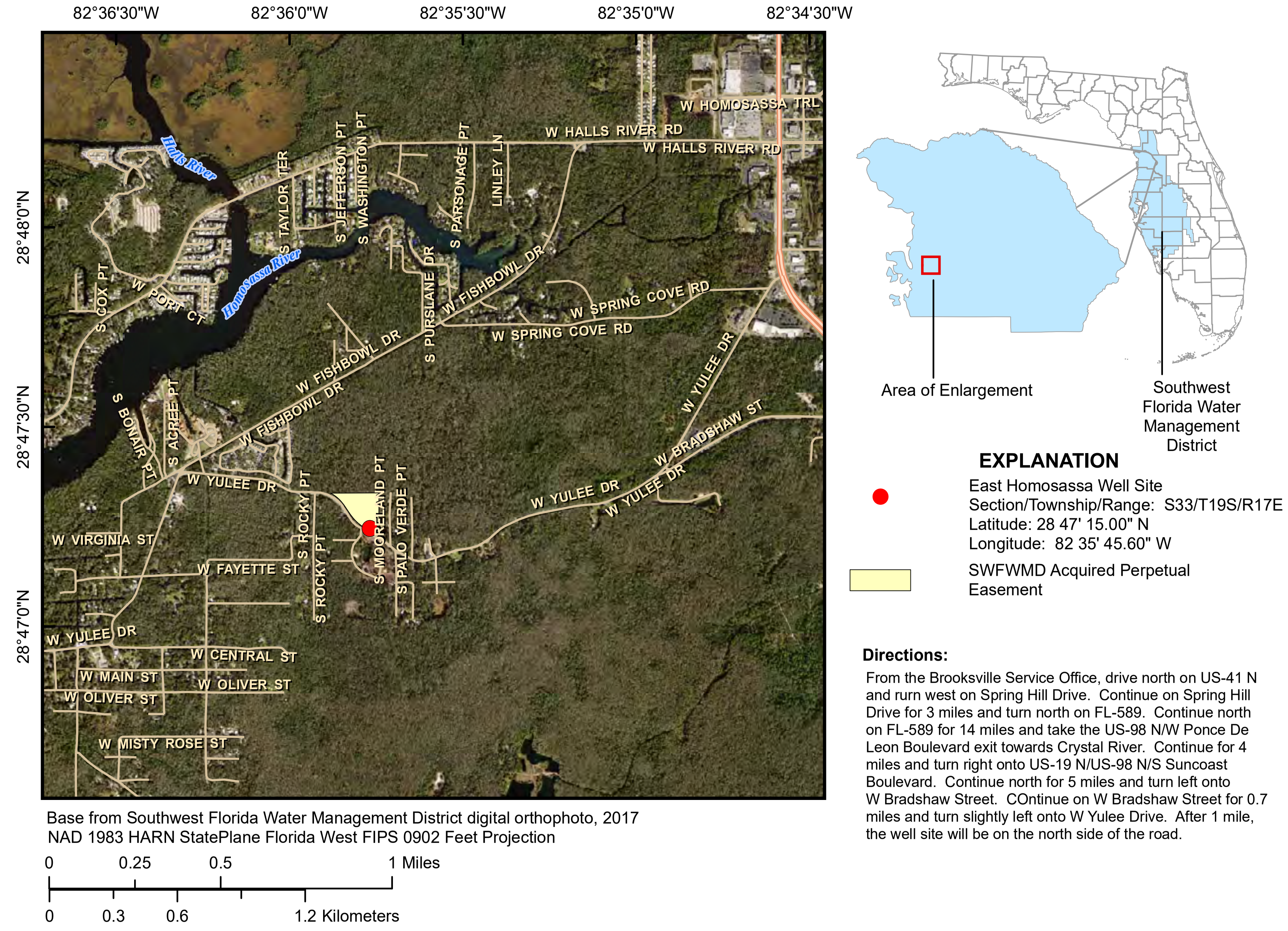
The East Homosassa well site investigation was conducted using a variety of methods to collect hydrogeologic data including lithologic, water quality, water level, and geophysical. The following sections provide the data collection method details specific to the East Homosassa well site. Data collected at this well site are available for download from the District's website: www.swfwmd.state.fl.us using the Environmental Data Portal (EDP). Data collection sites (wells) from this well site are compiled under the portfolio named East Homosassa. Water level and water quality data have been historically collected as of July 2016. Lithologic, geophysical, and stratigraphic data will be available within a District database in the future. This report, well construction details, and survey data are also available for download from the WMIS.

Lithologic Sampling

Lithologic samples were collected from land surface to 130 feet below land surface (bls). A post hole digger was used to dig a pilot hole to 1-foot bls where limestone was encountered and the post hole digger could not be advanced. Huss Drilling, Incorporated (Huss) performed hydraulic rotary coring to collect continuous lithologic samples from 1 foot to 130 feet using a Boart Longyear Morooka track rig, HQ (3-inch inside diameter steel coring rods) rods, and a wireline retrieval method. The samples were boxed, labeled, and described. The borehole was cleaned of cuttings between core runs using the air-lift discharge method.

Water Quality Sampling

Water quality sampling and testing were performed during exploratory core drilling to target the 1,000 milligram per Liter (mg/L) chloride surface. This chloride concentration



Base from Southwest Florida Water Management District digital orthophoto, 2017
NAD 1983 HARN StatePlane Florida West FIPS 0902 Feet Projection

Directions:

From the Brooksville Service Office, drive north on US-41 N and rurn west on Spring Hill Drive. Continue on Spring Hill Drive for 3 miles and turn north on FL-589. Continue north on FL-589 for 14 miles and take the US-98 N/W Ponce De Leon Boulevard exit towards Crystal River. Continue for 4 miles and turn right onto US-19 N/US-98 N/S Suncoast Boulevard. Continue north for 5 miles and turn left onto W Bradshaw Street. COntinue on W Bradshaw Street for 0.7 miles and turn slightly left onto W Yulee Drive. After 1 mile, the well site will be on the north side of the road.

Figure 2. Location of the East Homosassa Well Site in Citrus County, Florida.

identifies the vertical and geographic extent of the saltwater interace. Field samples were collected from the air-lift discharge between core runs to monitor specific conductance, pH, and temperature. Four discrete groundwater samples were collected for laboratory analysis using a submersible pump and an off-bottom packer to isolate 10-foot intervals within the borehole. The discharge rate was measured to ensure each discrete interval was purged a minimum of three borehole volumes and the samples collected were exclusively formation water After specific conductance, pH, and temperature were stable, the water sample was collected using a 3-inch submersible pump. A portion of each discrete sample was analyzed in the field for specific conductance, pH, temperature, chloride, and sulfate. The specific conductance, pH, and temperature were analyzed with a YSI DSS Multimeter and the chloride and sulfate concentrations were analyzed with a YSI 9300 Photometer. A 500 milliliter (ml) bottle was filled with unfiltered sample water and one 250 ml bottle and one 500 ml bottle were filled with filtered sample water. The sample in the 250 ml bottle was acidified with nitric acid to a pH of 2 to preserve metals for analysis. The samples were delivered to the District's Chemistry Laboratory for additional parameter analysis.

Water Level Collection

Daily static water levels in the core hole were recorded using a solinst meter before the start of exploratory core drilling. Water level data were also collected from the core hole during a packer test. After the off-bottom packer was inflated, the water level in the core rods was recorded after the water level stabilized.

Geophysical Logging

Borehole geophysical logs are used to delineate stratigraphic units, identify permeable zones, intervals and confining units, characterize water quality, and determine well casing points and grouting requirements. After the completion of the monitor wells at the East Homosassa well site, a caliper tool was run in the monitor wells to inspect the final well casing and total depths of the wells. The logs were collected by District staff using District-owned Century® geophysical logging equipment (table 1 and appendix A). The 9064A caliper tool collected data was run from land surface to 99.6 feet bls in the East Homosassa U Fldn Aq Monitor well and from land surface to 123.2 feet bls in the East Homosassa Saltwater Interface Monitor well on March 24, 2016.

Well Construction

Two permanent wells were constructed in the Upper Floridan aquifer at the East Homosassa well site that include the East Homosassa U Fldn Aq Monitor (Site ID 865190) and the East Homosassa Saltwater Interface Monitor (Site ID 865188) (fig. 3). Monitor well construction was completed by Huss under Well Construction Permit (WCP) number 847872 using a Boart Longyear Morooka track drill rig. A District geologist was on site during well construction.

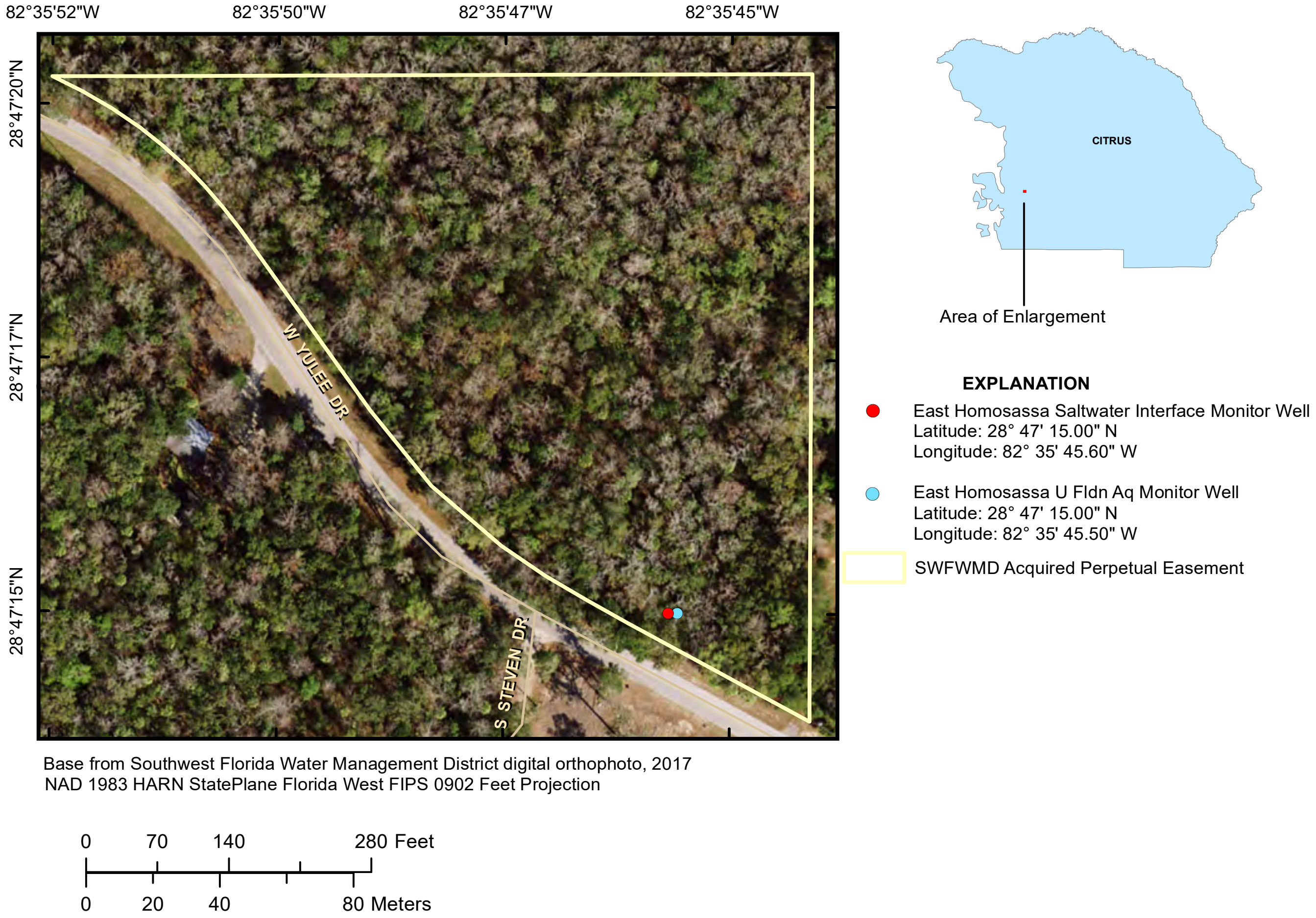
The saltwater interface monitor well was constructed between February 29, 2016, and March 15, 2016. The well construction specifications are in table 2 and the well as-built diagram is depicted in appendix B, figure B1. This well was modified from the exploratory core hole (East Homosassa Corehole [Site ID 863761]) after exploratory core drilling was completed. The geologist on site determined the total depth of the well should be 130 feet bls based on the lithologic and water quality data collected.

After exploratory core drilling, Huss tripped out the 3-inch HQ rods. Fine silica sand was poured into corehole to isolate 120 to 130 feet bls. The corehole was reamed from land surface to 120 feet bls with an 8-inch bit. Then, 4-inch diameter schedule 40 polyvinyl chloride (PVC) casing was installed from 3.13 feet above land surface (als) to 120 feet bls. A total of 80 bags of Portland Cement grout, 200 bags of gravel, 47 pounds of bentonite, and 8 bags of hole plug were used to seal the PVC casing. Huss tripped in the HQ core rods once the casing was set to remove the fine silica sand from

Table 1. Summary of the well construction details at the East Homosassa well site in Citrus County, Florida

[-, not measured; UFA, Upper Floridan aquifer; ft, feet; bls, below land surface; WCP, well construction permit; MM/DD/YYYY, month/day/year; PVC, polyvinyl chloride]

SID	Well Name	Open Interval (ft bls - ft bls)	Casing Type	Casing Diameter (inches)	Start Date (MM/DD/YYYY)	Complete Date (MM/DD/YYYY)	Status	WCP
863761	East Homosassa Corehole	0-130	--	--	2/29/2016	3/4/2016	Inactive	847872
865188	East Homosassa Saltwater Interface Monitor	120-130	PVC	4	3/9/2016	3/15/2016	Active	847872
865190	East Homosassa U Fldn Aq Monitor	80-99	PVC	4	3/16/2016	3/18/2016	Active	847872



Base from Southwest Florida Water Management District digital orthophoto, 2017
NAD 1983 HARN StatePlane Florida West FIPS 0902 Feet Projection

Figure 3. Well site layout for the East Homosassa well site in Citrus County, Florida.

120 ft to 130 ft. The core rods were removed from the well and the well was developed for 45 minutes. After development, a well cover and concrete pad were installed.

The Upper Floridan aquifer monitor well was constructed between March 16, 2016, and March 18, 2016. The well construction specifications are in table 2 and the well as-built diagram is depicted in appendix B, figure B2.

Huss started the pilot hole with a 3-inch HQ core bit. The drill bit deviated within the first ten feet of the hole. Huss changed to an 8-inch drill bit and reamed the hole to 15 feet bls. The hole was still crooked; therefore, Huss used a 10-foot by 5-¼ inch drill collar to help straighten the hole. After the hole was straight, an 8-inch hole was drilled from land surface to 81 feet bls. Four-inch schedule 40 PVC casing was installed from 3.15 feet als to 80 feet bls. A total of 34 bags of Portland Cement grout, 16 bags of gravel, and one bag of hole plug were used to set the casing. Then, Huss drilled the open hole from 80 feet bls to 100 feet bls with a 3-inch core barrel. The well was developed for 45 minutes. A well cover and concrete pad were installed, and the well was developed again for 45 minutes.

Additional well construction details can be found in the District's WMIS website. Daily logs for coring and well construction operations are available from the District's online document storage database.

The completed wells were equipped with continuous water level recorders by the District's Hydrologic Data Section for long-term groundwater level monitoring. Additionally, the Upper Floridan aquifer monitor and the Saltwater Interface monitor wells were entered into the District's long-term water quality monitoring program for sampling.

Geology

The lithostratigraphy of the East Homosassa well site is based on lithologic samples collected from the core hole. The geologic units encountered at the well site include, in ascending order: the Avon Park Formation and the Ocala Limestone. A stratigraphic column detailing the lithostratigraphy encountered at the well site is presented in figure 4. The lithologic log described by the Florida Geological Survey (FGS) is presented in appendix C.

Avon Park Formation (Middle Eocene)

The middle Eocene Avon Park Formation extends from 70 feet bls to beyond the total depth of exploration of 130 feet bls at the East Homosassa well site. The top of the Avon Park Formation is based on the disappearance of the foraminifer *Lepidocyclina sp*. and *Nummulities sp.,* which are index fossils characteristic of the Ocala Limestone and the appearance of the foraminifera *Cushmania americana* (*Dictyoconous americanus)* fossil, which is an index fossil characteristic of the Avon Park Formation. The Avon Park Formation is primarily grayish orange silt-size dolomite and dolostone, and yellowish gray wackestone, packstone, and mudstone. Induration ranges from moderate to good. The previously mentioned foraminifera *Dictyoconous americanus* was observed between 122 feet and 124 feet bls. Other fossil molds and fragments observed primarily include bryozoa, miliolids, and mollusks. The observable porosity ranges from 10 to 55 percent. Beginning at 110 feet to 130 feet bls, the lithology changes to a fine-grained wackestone and mudstone and the observed porosity is the lowest in this interval. Trace amounts of chalcopyrite were observed from 70 to 78 feet bls and from 104 to 108 feet bls (appendix C). Organic laminae are present from 112 to 130 feet bls. Core recovery ranged from 15 to 87 percent in the Avon Park Formation.

Ocala Limestone (Late Eocene)

The late Eocene Ocala Limestone extends from land surface to 70 feet bls at the East Homosassa well site. The Ocala Limestone unconformably overlies the Avon Park Formation. The top of the Ocala Limestone is very weathered at the East Homosassa well site. The Ocala Limestone primarily consists of yellowish gray, moderately indurated, very fossiliferous wackestone, packstone, and grainstone. *Lepidocyclina ocalana* and *Nummulities ocalanus* were present from land surface to 54 feet bls and from land surface to 30 feet bls, respectively. Both foraminifera are common index fossils to the Ocala Limestone. Other fossil molds and fragments observed include bryozoa, miliolids, mollusks, gastropods, and coral. The observable porosity ranges from 45 to 60 percent, characterized as moldic and vugular from land surface to 14 feet bls and moldic and pinpoint from 14 feet to 70 feet bls. Core recovery ranged from 50 to 100 percent in the Ocala Limestone.

Hydrogeology

The hydrogeology at the East Homosassa well site is based on the lithologic, water level, and discharge flow rate data collected during exploratory coring and testing. The hydrogeologic unit delineated at the East Homosassa well site includes the Upper Floridan aquifer (fig. 4 and appendix E).

At the East Homosassa well site, the Upper Floridan aquifer is considered unconfined from land surface to the

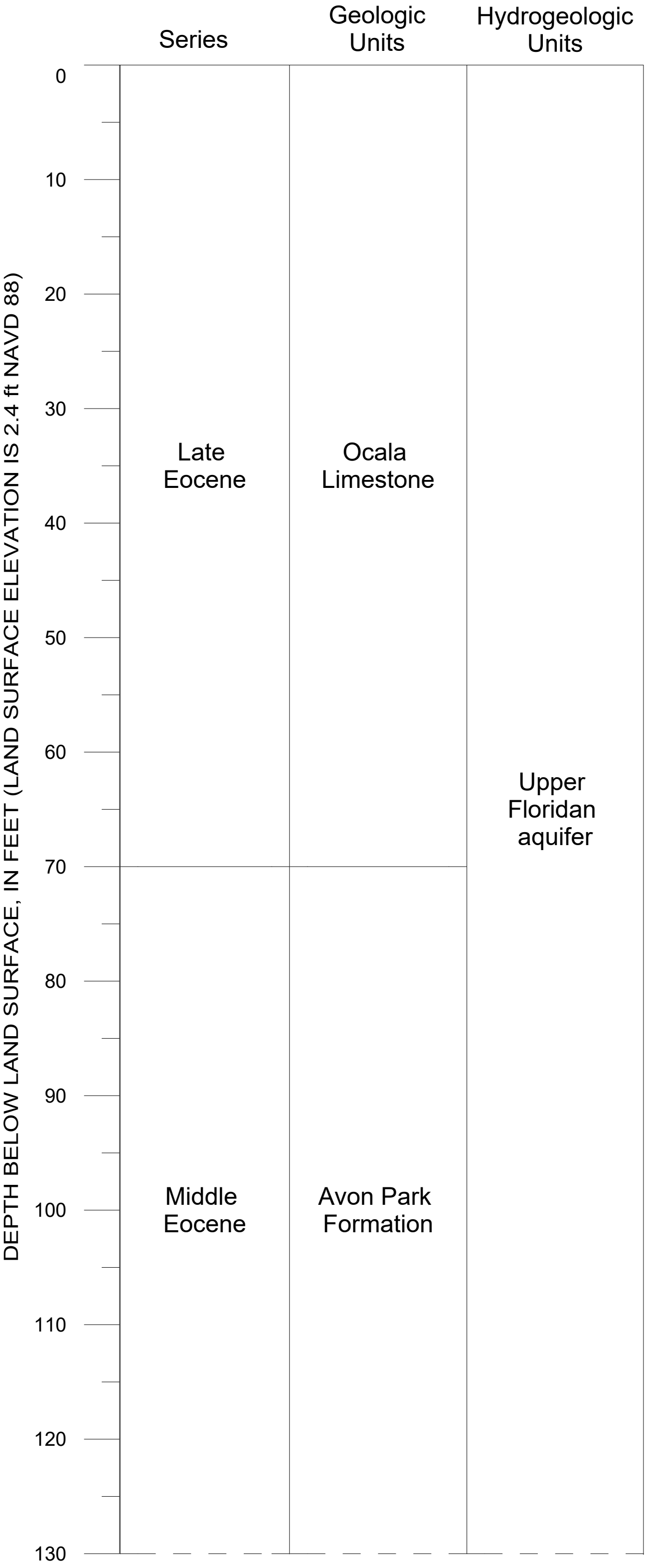


Figure 4. Stratigraphic column detailing the hydrogeologic setting at the East Homosassa well site in Citrus County, Florida.

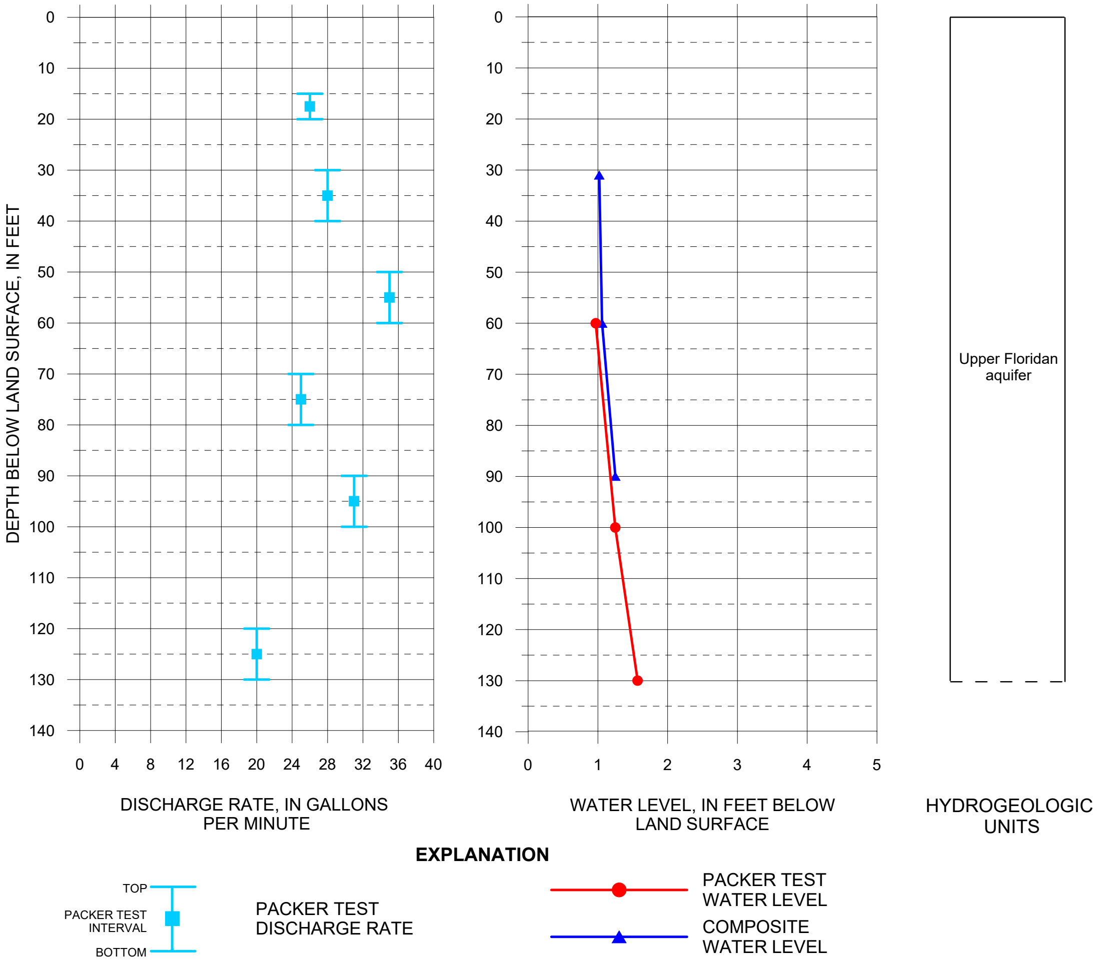


Figure 5. Packer test discharge rates, packer test water level and composite water level profile at the East Homosassa well site in Citrus County, Florida. The discharge rate depth represents the middle of the discrete open interval at the time of sampling. The packer test and composite water level depths are the total depth of the exploratory corehole.

depth of exploratory coring at 130 feet bls (fig. 4). The general lack of confinement at the East Homosassa well site allows rainwater to directly recharge the Upper Floridan aquifer.

Water level measurments were collected by two different methods at the East Homosassa well site; composite and packer tests (fig. 5, appendix E). Three composite water levels were collected within the HQ core rod prior to exploratory coring. Three packer test water levels were collected after the formation packers were set and the water levels stabilized. Water level data show a minor decline from 60 feet to 130 feet bls. The onsite geologist noted when airlifting the interval from 110 feet to 120 feet bls, the discharge was minimal and the water level was very slow to recharge. This is likely the result of the tight wackestone and mudstone identified in the lithology between 110 feet and 124 feet bls. The discharge rates measured during packer tests ranged from 26 to 35 gallons per minute (gpm) in the Ocala Limestone and ranged from 20 to 31 gpm in the Avon Park Formation (fig. 5).

Starting June 2016, hourly water level data have been collected from the East Homosassa U Fldn Aq Monitor well and the East Homosassa Saltwater Interface Monitor well (fig. 6). The water levels collected in both monitor wells are relatively similar. This suggests there is no confinement within the Upper Floridan aquifer from 80 feet to 130 feet bls at the East Homosassa well site.

Water level data collected in the monitor wells show periodic rise above land surface elevation throughout the period of record (fig. 6). The elevated water levels coincide with historical storm events that affected Citrus County, such as Hurricane Hermine in September 2016, Hurricane Irma in September 2017, and Tropical Storm Nestor in October 2019. When the water levels are elevated, District data collection staff need to use waders to walk to the monitor wells from W Yulee Drive to sample the well. This supports the Upper Floridan aquifer is unconfined at the East Homosassa well site.

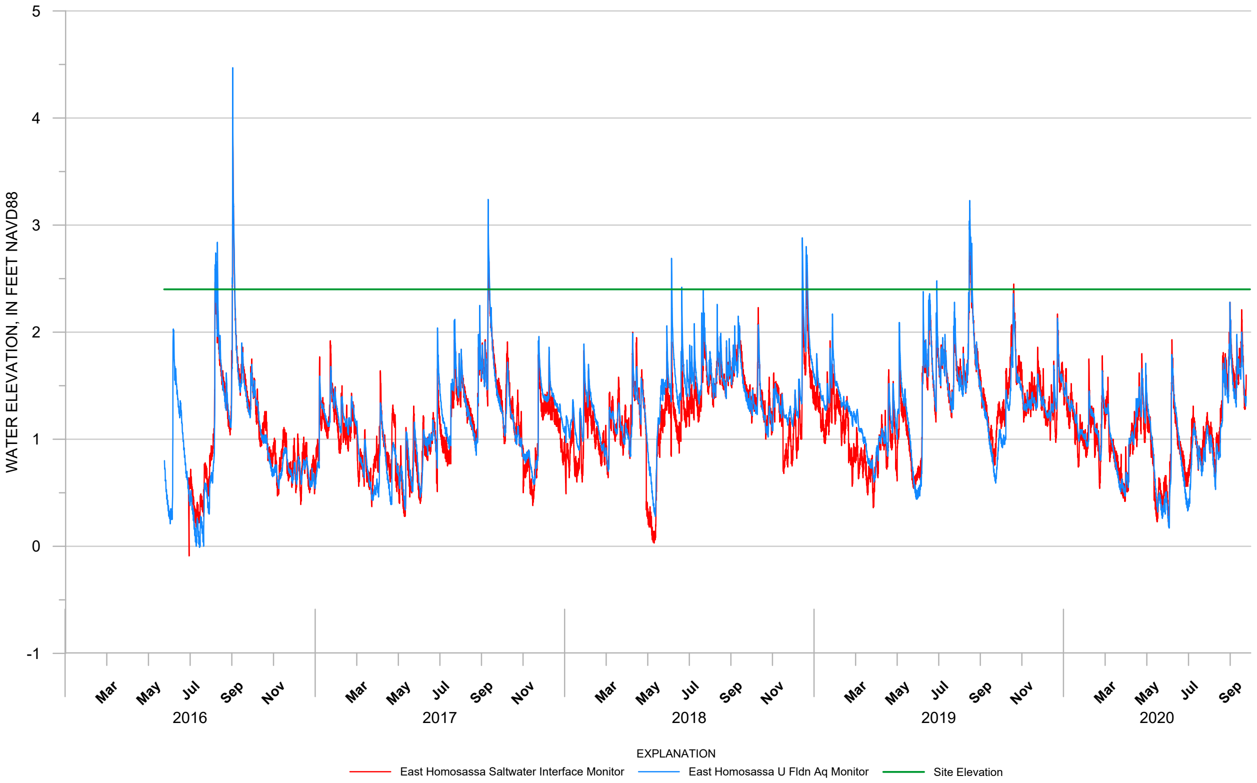


Figure 6. Hydrograph of the permanent monitor wells at the East Homosassa well site in Citrus County, Florida.

Groundwater Quality

Analysis of groundwater samples conducted in the field and laboratory provide data for the groundwater quality characterization of the East Homosassa well site. The results of those analyses are presented in appendix G, tables G1, and G2 respectively. The groundwater water quality sample acquisition sheets are presented in appendix F. The U.S. Environmental Protection Agency's National Secondary Drinking Water Regulations (secondary standards) for total dissolved solids (TDS), sulfate, chloride, and iron are 500 milligrams per liter (mg/L), 250 mg/L, 250 mg/L, and 0.3 mg/L (300 micrograms per liter, µg/L), respectively (Hem, 1985; U.S. Environmental Protection Agency, 2018).

The major ion concentrations analyzed in the four laboratory samples were compared to the secondary standards. The results of the first water quality sample collected within the Ocala Limestone from 30 to 40 feet indicates the groundwater is fresh and potable because the constituents tested did not exceed secondary standards (fig. 7 and appendix G, table G2).

The results of water quality samples two and three collected within the Avon Park Formation from 70 to 80 feet bls and 90 to 100 feet bls, respectively, indicate the groundwater is fresh, but not potable. Chloride and sulfate concentrations, and TDS are below the secondary standards but the iron concentration is above the secondary standards (fig. 7 and appendix G, table G2) The chalcopyrite ($CuFeS_2$) observed from 70 to 80 feet bls and from 104 to 108 feet bls may be the source of the elevated iron.

The results of the fourth water quality sample collected within the Avon Park Formation, from 120 to 130 feet bls, indicate the groundwater is not fresh or potable. The chloride concentration is 3,060 mg/L, the sulfate concentration is 504 mg/L, and the TDS concentration is 5,750 mg/L, all which exceed the secondary standards. The 1,000 mg/L chloride isochlor was surpassed between 100 to 130 feet bls. The increase in ion concentrations is likely the effect of nearing the freshwater/saltwater interface.

Beginning January 2016, tri-annual water quality samples have been collected by the Water Quality Monitoring Program at the East Homosassa well site. Analysis shows the chloride concentration has been greater than 3,000 mg/L since the start of collection. The last sample collected was on May 12, 2020. Analysis from this sample shows the chloride concentration reached 3,860 mg/L.

The trends of the relative abundance of each major cation and anion species analyzed for the groundwater quality samples collected at the East Homosassa well site are pre-

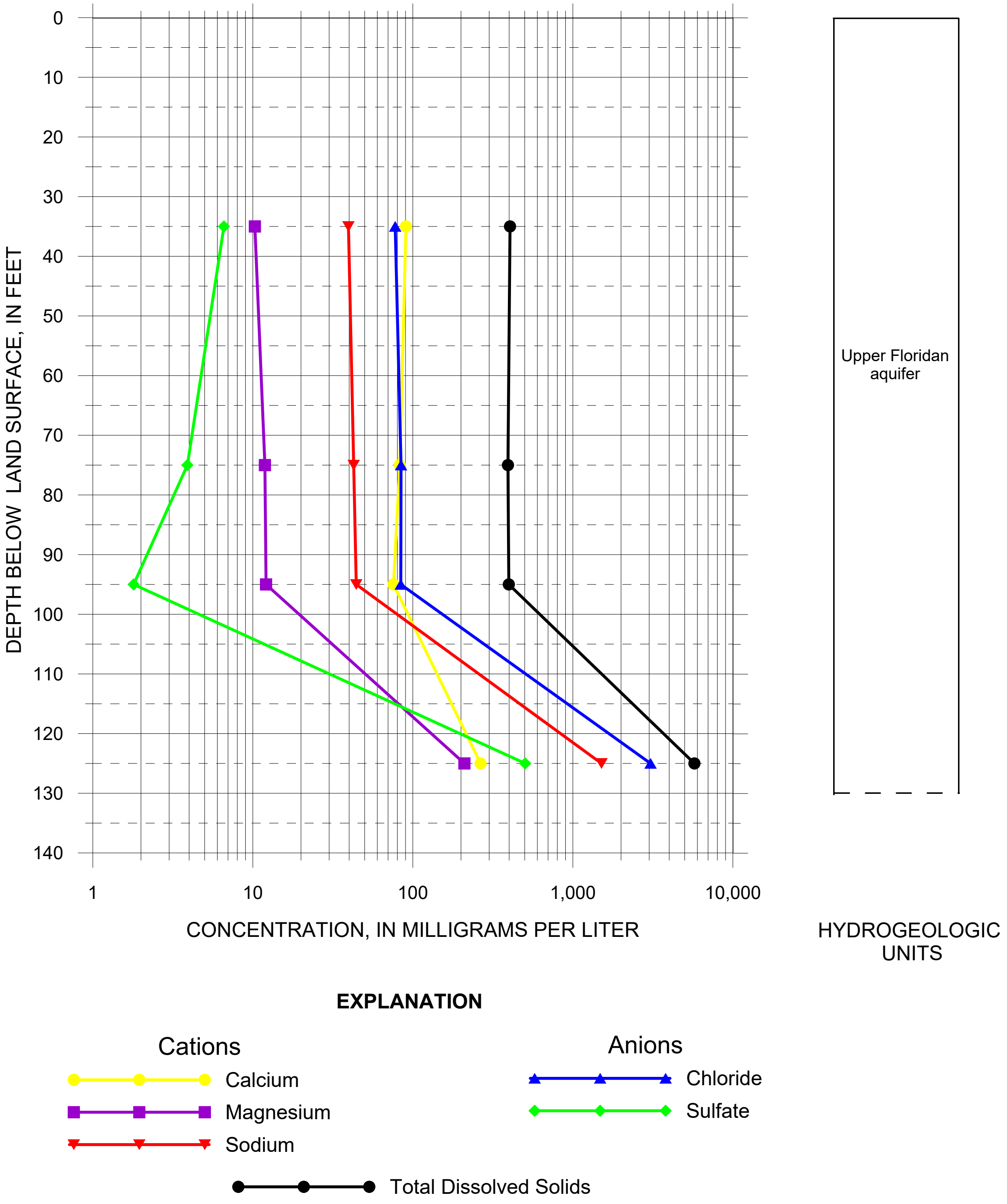


Figure 7. Select cations and anions, and total dissolved solid concentrations for grounwater quality samples collected at the East Homosassa well site in Citrus County. Depth represents the middle of the discrete open interval at the time of sampling.

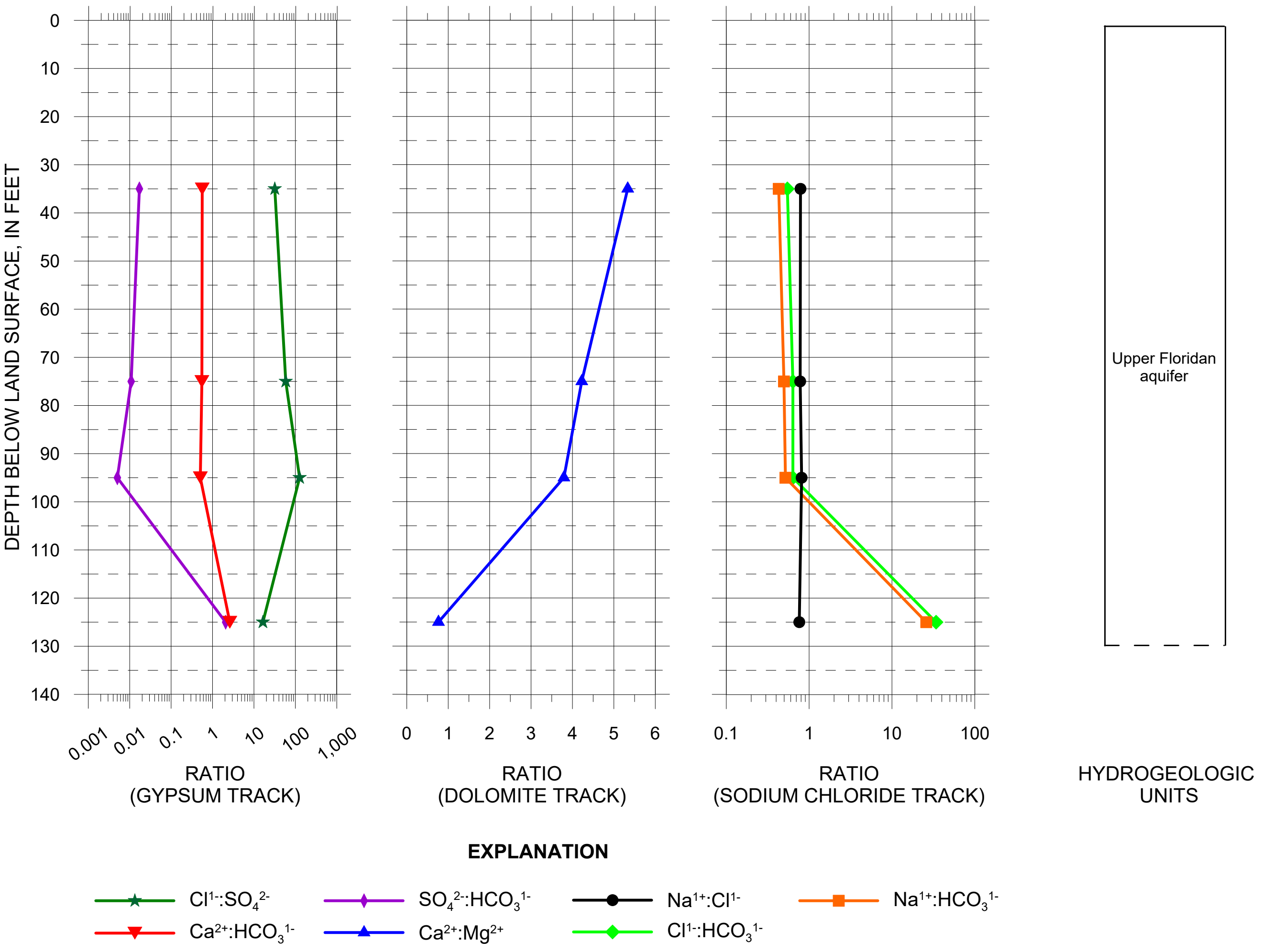


Figure 8. Select molar ratios with depth for groundwater quality samples collected at the East Homosassa well site in Citrus County, Florida. Depth represents the middle of the discrete open interval at the time of sampling.

sented on a Piper (1944) diagram in figure 9 as percent milliequivalents. Groundwater samples one through three generally plot in the bottom left of the anion and cation ternary diagrams and the middle left of the quadrilateral diagram, which is typical for a calcium bicarbonate water type that is not influenced by seawater or deepwater mixing (Tihansky, 2005). Water quality sample number four plots in the bottom right of the anion and cation ternary diagrams and the middle right of the quadrilateral diagram. The sample plots at the end of the freshwater/seawater mixing trend line, which is indicative of where seawater mixing occurs in groundwater.

Select molar ratios were calculated to investigate groundwater changes with depth (fig. 8 and appendix G, table G4). The gypsum track illustrates the interaction between fresh water and evaporites (gypsum and anhydrite). The dolomite track primarily identifies fresh water affected by dolomite. The sodium chloride track depicts effects from connate or seawater. The chloride to sulfate molar ratio on the gypsum track spikes in the last packer test; between 120 ft and 125 ft bls. Both ions increased but the chloride ion increases at a faster rate than the sulfate ion. This indicates the chloride in the seawater has a greater influence in sample four than from the sulfate that would come from the evaporites. The calcium to magnesium molar ratio on the dolomite track decreases at 125 feet bls, indicating no influence from gypsum or anhydrite on the groundwater as these minerals were not identified in the core at these depths. The sodium to chloride molar ratios on the sodium chloride track show very little notable variations with depth, because both ion concentrations are increasing at similar rates. The chloride to bicarbonate and sodium to bicarbonate molar ratios both spike because of bicarbonate concentrations decrease and an increase in chloride and sodium concentrations occur.

Summary

The Geohydrologic Data Section of the Data Collection Bureau conducted a hydrogeologic investigation at the East Homosassa well site in Citrus County, Florida. The primary

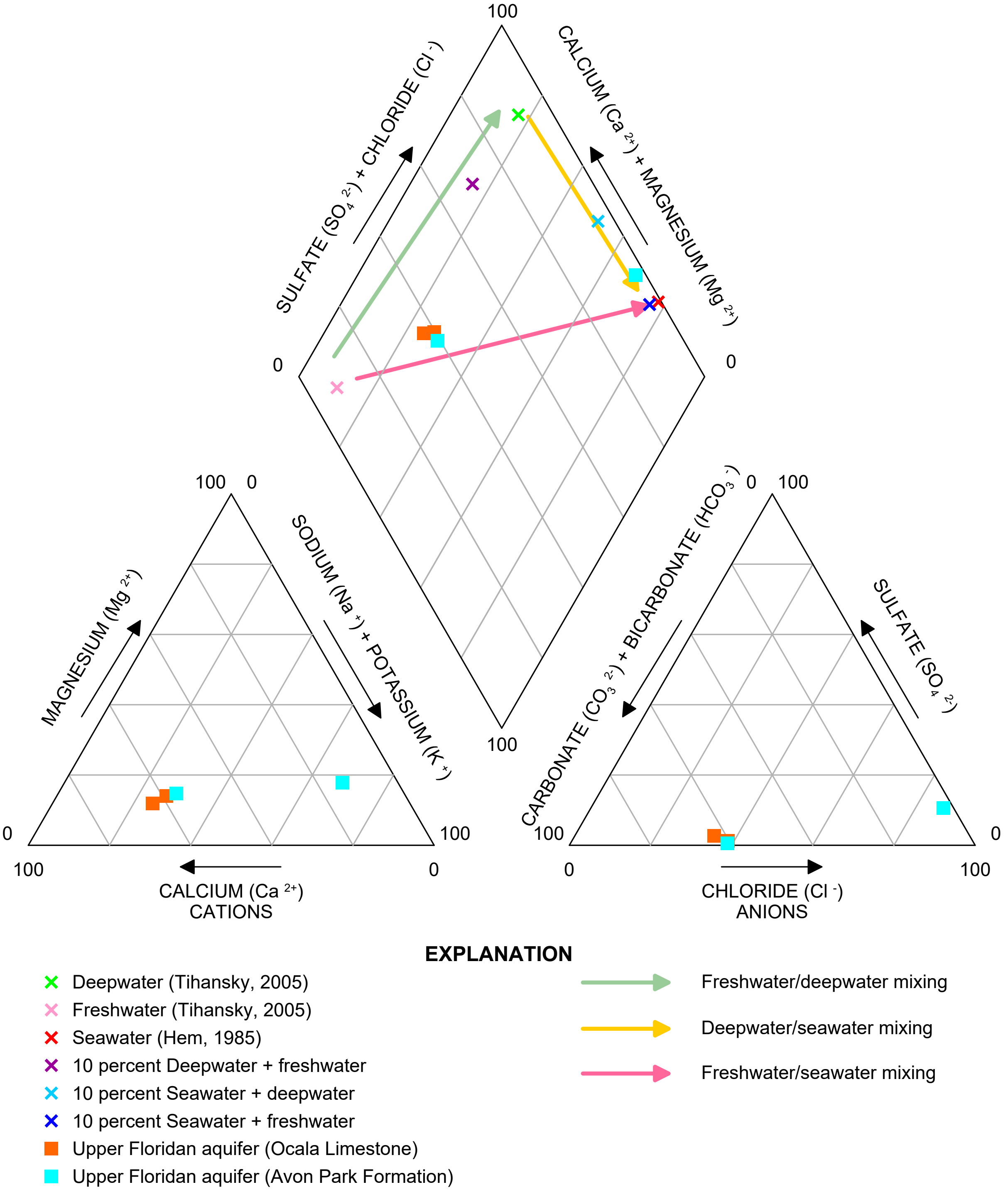


Figure 9. Piper Diagram of groundwater quality samples collected at the East Homosassa well site in Citrus County, Florida.

objectives at the East Homosassa well site were to identify the vertical and geographic extent of the saltwater interface (the 1,000 mg/L chloride isochlor) and to construct wells for long-term water level and water quality monitoring. The District contracted Huss Drilling, Incorporated, to collect continuous lithologic cores and to construct the monitor wells. Testing and sampling performed at this site included lithologic (core) sampling, geophysical logging, water quality sampling, and water level profiling. Two monitor wells were constructed at East Homosassa well site: the East Homosassa U Fldn Aq Monitor and the East Homosassa Saltwater Interface Monitor.

The geologic units encountered at the East Homosassa well site, in ascending order, are: the Avon Park Formation and the Ocala Limestone. The Avon Park Formation extends from 70 ft to beyond the total depth of exploration of 130 ft bls. The Ocala Limestone extends from land surface to 70 ft bls.

The only hydrogeologic unit encountered at the East Homosassa well site was the Upper Floridan aquifer. The base of the Upper Floridan aquifer was not encountered at this well site.

Water levels with depth were recorded daily during exploratory coring. Water levels show a slight decline during exploratory coring and had a significant drop when the lower permeable unit and freshwater/saltwater interface was encountered.

Four packer tests were conducted during exploratory coring at the East Homosassa well site. The water quality data indicates the groundwater in the Upper Floridan aquifer is potable within the first 40 feet and not potable from 40 feet bls to the bottom of the core hole at 130 feet bls.

The data collected from exploratory coring and the long-term water level and water quality data will support the Northern District Water Resources Assessment Project (Basso, 2007). The data will also support the Upper Floridan Aquifer Nutrient Monitoring and the Coastal Groundwater Quality Monitoring Networks under the Water Quality Monitoring Program.

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Appendix A. Geophysical Log Suites for the East Homosassa Well Site in Citrus County, Florida

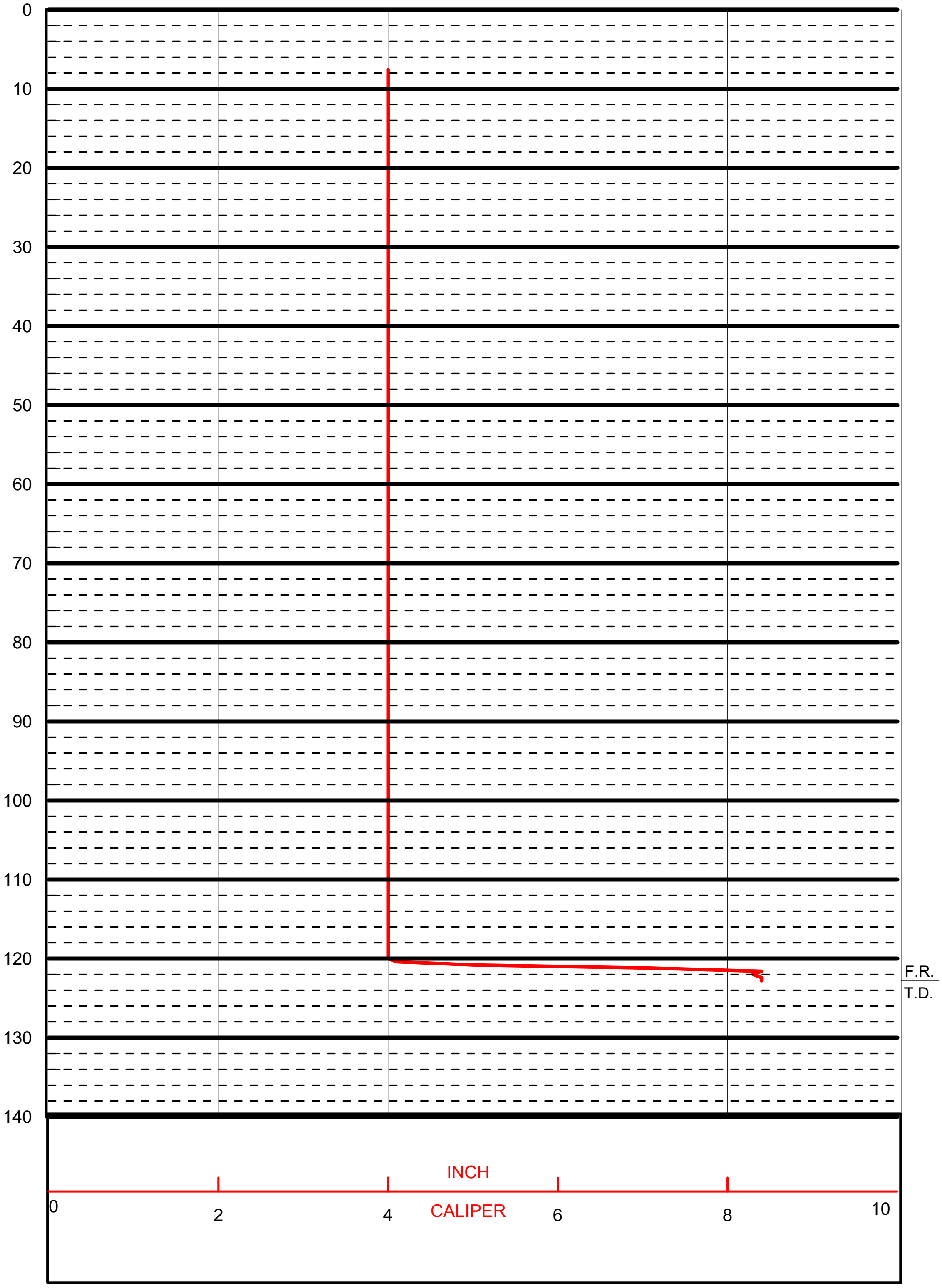


Figure A1. Geophysical log suite for the East Homosassa Saltwater Interface Monitor well from land surface to 123.2 feet below land surface conducted at the East Homosassa Well Site in Citrus County, Florida. The logging was performed on March 24, 2016, using the 9064A (caliper/gamma-ray) tool. The log was run in the borehole with four-inch Scheduled 40 polyvinyl chloride casing set to 120 feet below land surface. The vertical axis scale is 1-inch per 20 feet. The horizontal axis is linear. The first read (F.R.) is 123.2 feet below land surface.

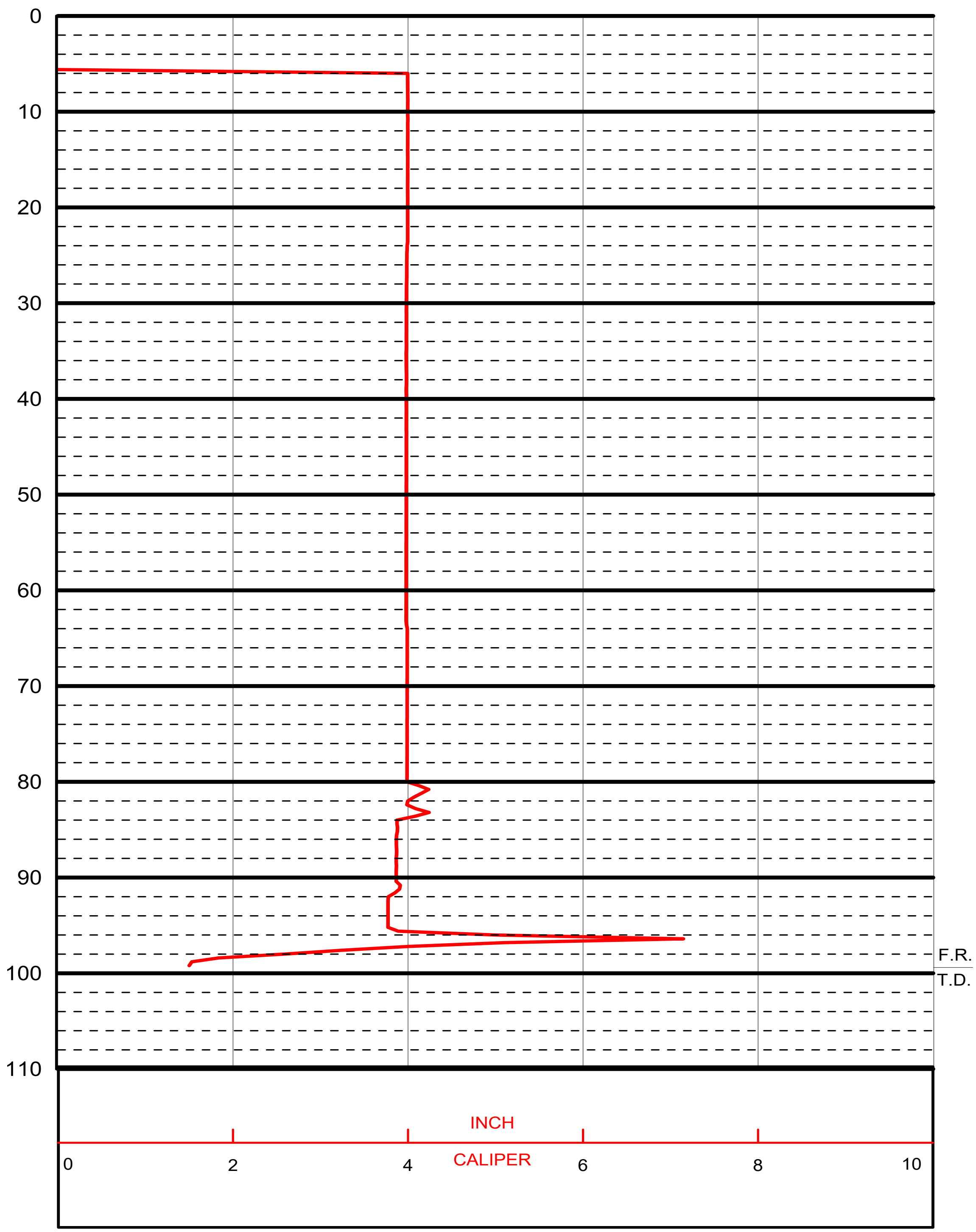
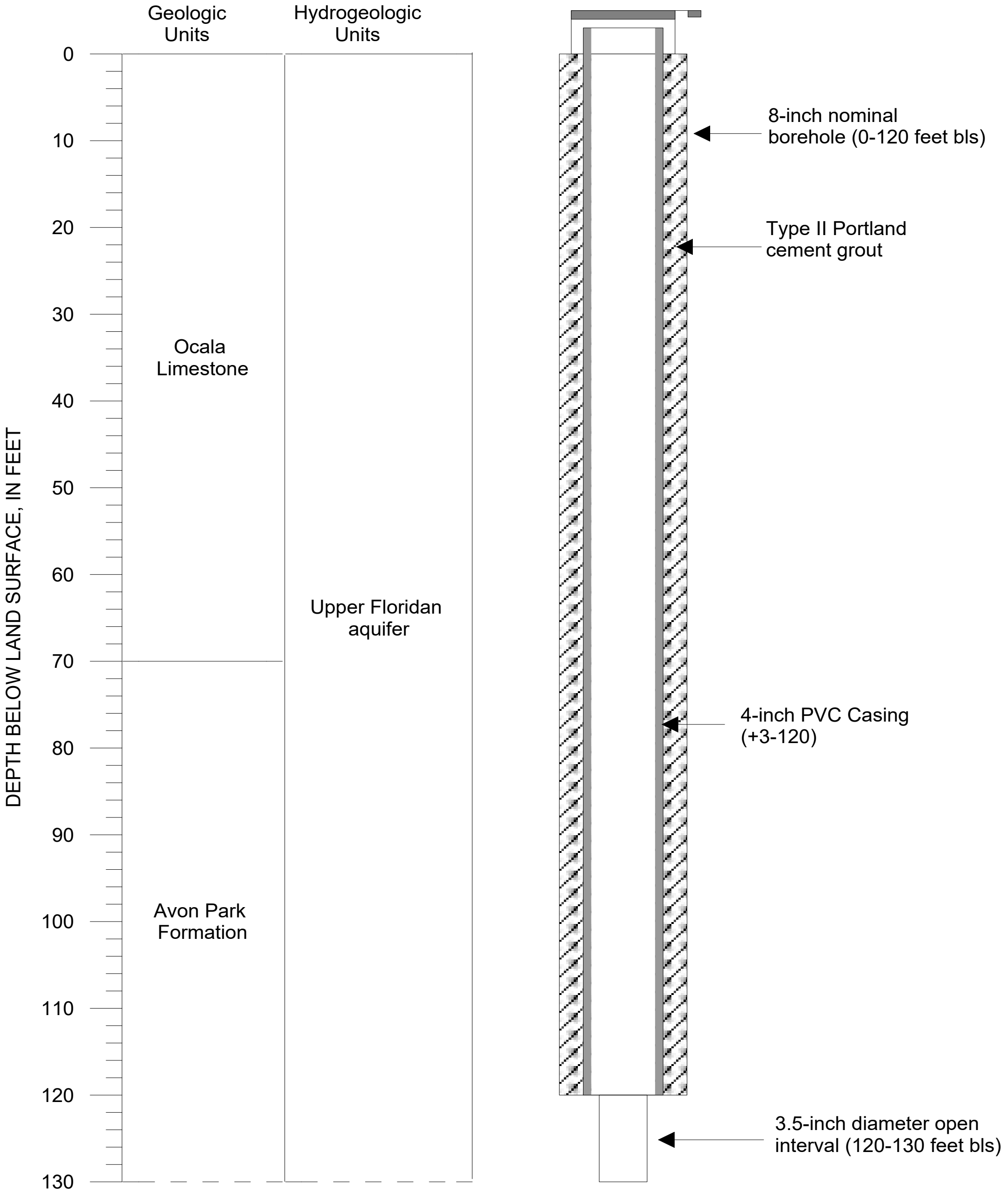


Figure A2. Caliper log for the Upper Floridan Aquifer Monitor Well from 5.6 feet to 99.2 feet below land surface conducted at the East Homosassa well site in Citrus County, Florida. The log was performed on March 24, 2016, using the 9064A (caliper/gamma-ray) tool. The log was run in the borehole with a four-inch Scheduled 40 PVC casing set to 80 feet below land surface. The vertical axis scale is 1-inch per 20 feet. The horizontal axis scale is linear. The F.R. is 99.2 feet below land surface.

Appendix B. Well As-built Diagrams for the East Homosassa Well Site in Citrus County, Florida



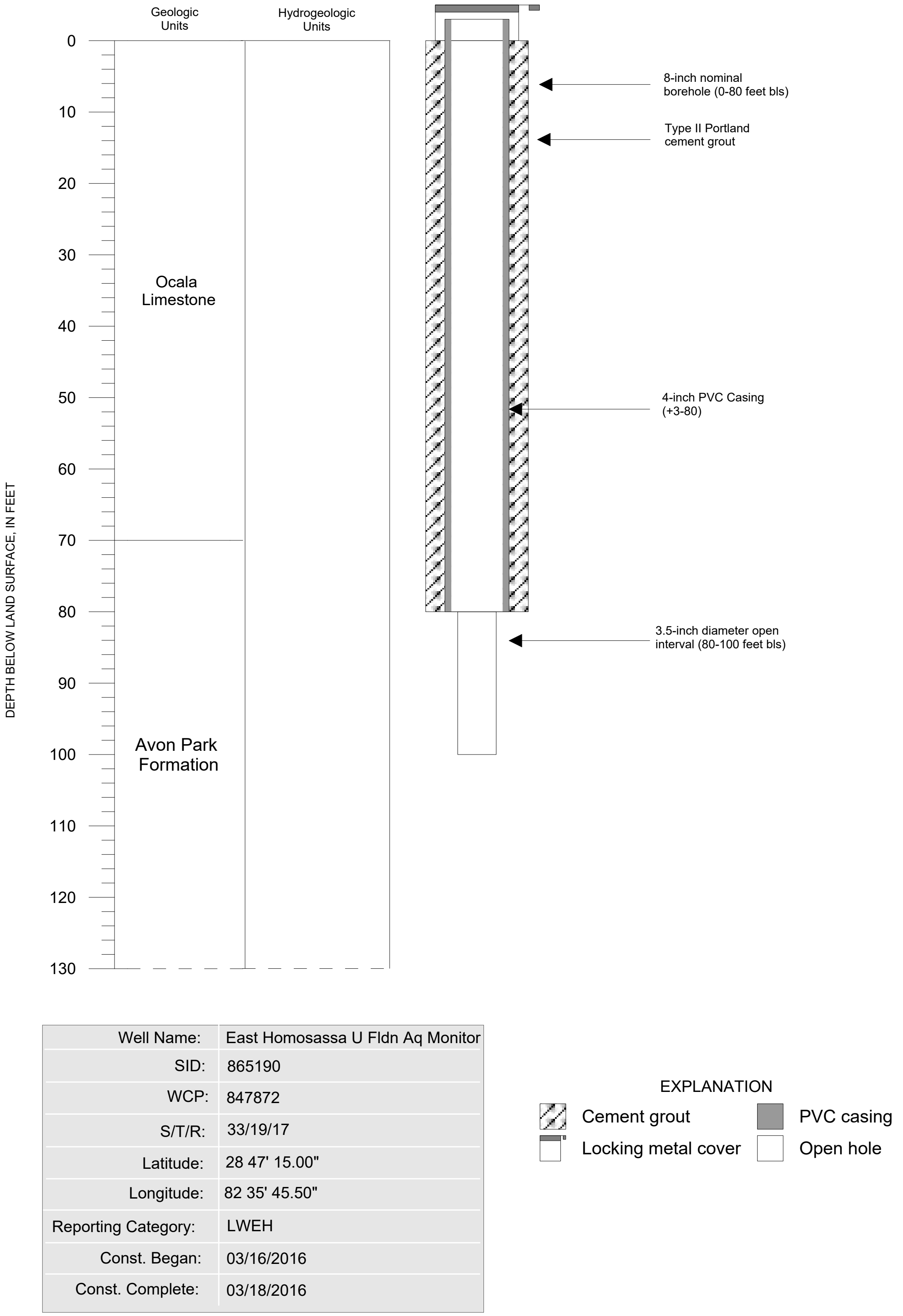
Well Name:	East Homosassa Saltwater Interface
SID:	865188
WCP:	847872
S/T/R:	33/19/17
Latitude:	28 47' 15.00"
Longitude:	82 35' 45.60"
Reporting Category:	LWEH
Const. Began:	02/29/2016
Const. Complete:	03/15/2016

EXPLANATION

▨ Cement grout
▩ PVC casing
▭ Locking metal cover
☐ Open hole

The East Homosassa Corehole was converted to the East Homosassa Saltwater Interface Monitor after the 4,200 mg/L chloride interface was encountered.

Figure B1. Well as-built for the East Homosassa Saltwater Interface Monitor.



Well Name:	East Homosassa U Fldn Aq Monitor
SID:	865190
WCP:	847872
S/T/R:	33/19/17
Latitude:	28 47' 15.00"
Longitude:	82 35' 45.50"
Reporting Category:	LWEH
Const. Began:	03/16/2016
Const. Complete:	03/18/2016

Figure B2. Well as-built for the East Homosassa UFA Monitor.

Appendix C. Lithologic Logs for the Samples Collected at the East Homosassa Well Site in Citrus County, Florida

Well Number: W-19636 (East Homosassa)

Total Depth 130 feet
Elevation: 2.4 feet
#Error
Drill Completion Date:
Other Logs:
Owner/Driller:
Described by: BEN L. DAVIS in 2017
Comments: 13 boxes of 2" core from 0'-130'.

County: Citrus
Location:
Lat/Long: 28° 47' 15" N; 82° 35' 45.6" W
USGS Quad:
Entered By B.L. Davis

XSR:
TOR:
SFrm: OCAL

Verification:
Not Yet Verified

Geological Formation Picks

0 - 70 ft	OCAL	Ocala Limestone
70 - 130 ft	AVPK	Avon Park Formation

0 - 2 ft	Wackestone; Yellowish Gray (5Y 8/1); 60% Porosity: Moldic, Vugular; Grain Type: Calcilutite, Pellet; 30% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifera-rich interval. Fossil molds are abundant. Fossil abundance increases with depth in interval. *Index Fossils: Lepidocyclina ocalana*
2 - 3 ft	Packstone; Yellowish Gray (5Y 8/1); 60% Porosity: Moldic, Vugular; Grain Type: Calcilutite, Pellet; 60% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-15%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifera-rich interval. Fossil molds are abundant. More fossils present than in previous interval. Small gastropods present throughout interval. *Index Fossils: Lepidocyclina ocalana, Nummulites ocalanus*
3 - 4 ft	Packstone; Yellowish Gray (5Y 8/1); 60% Porosity: Moldic, Vugular; Grain Type: Calcilutite, Pellet; 60% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Unconsolidated; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-16%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifera-rich interval. Fossil molds are abundant. Interval broken out due to poor induration and poor recovery. *Index Fossils: Lepidocyclina ocalana, Nummulites ocalanus*
4 - 6 ft	Packstone; Yellowish Gray (5Y 8/1); 60% Porosity: Moldic, Vugular; Grain Type: Calcilutite, Pellet; 40% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-14%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifera-rich interval. Fossil molds are abundant. Top of interval is less fossiliferous than bottom of interval by ~10%. Large gastropod molds (~1.5"-2") present in this interval. *Index Fossils: Lepidocyclina ocalana*
6 - 8 ft	Grainstone; Yellowish Gray (5Y 8/1); 60% Porosity: Moldic, Vugular; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-15%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifera-rich interval. Fossil molds are abundant. Top of interval (~6'-7.5') is more indurated than the bottom section of interval which had poor recovery. Box is 0'-10' but only 0'-8' was in box (8'-10' is missing). *Index Fossils: Lepidocyclina ocalana, Nummulites ocalanus*
10 - 12 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Vugular; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-17%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifer-rich interval. Fossil molda are abundant. More grain supported than shallower intervals. Vugs are also more abundant than shallower intervals. Top of interval (10'-10.5') is less indurated than the rest of the interval. *Index Fossils: Lepidocyclina ocalana*
12 - 14 ft	Packstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Vugular; Grain Type: Calcilutite, Pellet; 55% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-15%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifera-rich interval. Fossil molds are abundant. More bryozoans than previous intervals. 13'-14' only had roughly 50% recovery. *Index Fossils: Lepidocyclina ocalana*

14 - 16 ft	Packstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 40% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-13%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Less foraminifera-rich than previous intervals. Less vuggy than previous intervals. *Index Fossils: Lepidocyclina ocalana*
16 - 18 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-17%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifera-rich interval. Pinpoint vugs and fossil molds are abundant throughout interval. This is a bryozoan-rich interval. More grain supported than previous intervals. *Index Fossils: Lepidocyclina ocalana*
18 - 20 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Unconsolidated; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-18%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Foraminifera-rich interval. Pinpoint vugs and fossil molds are abundant. Bryozoans are abundant throughout interval. 18'-20' is unconsolidated induration with only ~70% recovery. *Index Fossils: Lepidocyclina ocalana*
20 - 22 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Poor Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-20%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Less foraminifera than previous intervals. Bryozoan and gastropod rich interval. Yellow staining (5Y 8/4) around 21' in interval. *Index Fossils: Lepidocyclina ocalana*
22 - 24 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-15%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Foraminifera content is same as above. Bryozoans and gastropods are abundant. 22'-22.5' is poorly indurated. *Index Fossils: Lepidocyclina ocalana*
24 - 26 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-14%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Foraminifera content is same as above. Bryozoans are less abundant than previos interval. 24'-25' is poorly indurated. *Index Fossils: Lepidocyclina ocalana*
26 - 28 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-15%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Bryozoans and gastropods are abundant throughout interval. 26'-27.5' is poorly indurated. *Index Fossils: Lepidocyclina ocalana*
28 - 30 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Bryozoans and gastropods range in size and are abundant throughout interval. 28'-30' interval only contains 1' of core sample. *Index Fossils: Lepidocyclina ocalana, Nummulites ocalanus*
30 - 32.5 ft	Grainstone; Yellowish Gray (5Y 8/1); 45% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Bryozoans and gastropods are abundant. *Index Fossils: Lepidocyclina ocalana*
32.5 - 35 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Bryozoans and gastropods are abundant. *Index Fossils: Lepidocyclina ocalana*

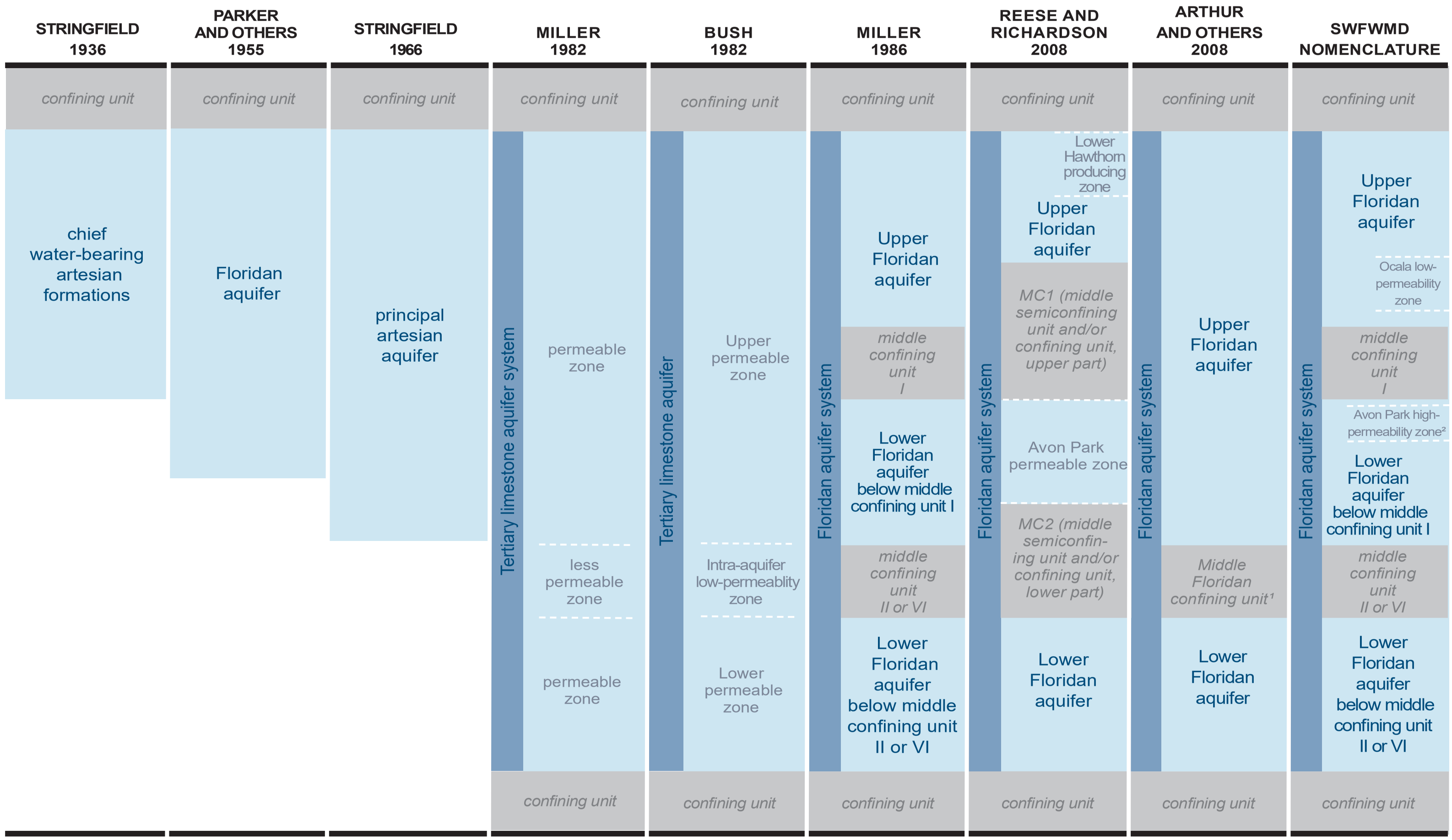
35 - 37.5 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Contains more gastropods than bryozoans. *Index Fossils: Lepidocyclina ocalana*
37.5 - 40 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Less bryozoans and gastropods than previous interval.
40 - 42 ft	Grainstone; Light Greenish Yellow (10Y 8/2); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Fossil molds are abundant throughout. *Index Fossils: Lepidocyclina ocalana*
42 - 44 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Fossil Molds, Mollusks; Very fossiliferous interval. Same as above. *Index Fossils: Lepidocyclina ocalana*
44 - 46 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-10%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Coral, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Scleractinian coral is present in this interval. *Index Fossils: Lepidocyclina ocalana*
46 - 48 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-5%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Coral, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Multiple scleractinian corals present. Fossil molds are abundant.
48 - 50 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-5%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Coral, Miliolids, Mollusks, Fossil Molds; Very fossiliferous interval. Same as above.
50 - 52 ft	Packstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 70% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-1%, Gypsum-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Fossil Molds; Very fossiliferous interval. Finer grained than previous intervals. Fossil molds are abundant.
52 - 54 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-2%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Fossil Molds; Very fossiliferous interval. Same as above. *Index Fossils: Lepidocyclina ocalana*
54 - 56 ft	Grainstone; Yellowish Gray (5Y 8/1) to Grayish Yellow (5Y 8/4); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-1%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids; Very fossiliferous interval. 54'-55' is lighter in color than 55'-56' which is grayish yellow (5Y 8/4).
56 - 58 ft	Grainstone; Yellowish Gray (5Y 8/1); 60% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-1%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Fossil Fragments; Very fossiliferous interval. 57'-58' consists of chips and gravels. Bryozoans are abundant throughout interval.
58 - 60 ft	Grainstone; Yellowish Gray (5Y 8/1); 50% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-1%, Gypsum-<1%, Calcite-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Fossil Fragments; Very fossiliferous interval. Calcified fossil molds present throughout interval. 58'-60' interval only contains roughly 8" of core most likely attributed to poor recovery.

60 - 62 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Calcite-1%, Shell-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Fossil Fragments; Calcified fossil molds are abundant. Very fossiliferous interval. This interval consists of broken up and smashed core.
62 - 64 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-3%, Calcite-1%; Other Features: Calcareous, Fossiliferous; General Fossils: Echinoid, Benthic Foraminifera, Miliolids, Mollusks, Fossil Fragments; Calcified fossil molds are abundant throughout interval. More fossiliferous than previous interval.
64 - 66 ft	Grainstone; Yellowish Gray (5Y 8/1); 55% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 95% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Phosphate; Accessory Minerals: Shell-3%, Calcite-2%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Benthic Foraminifera, Miliolids, Mollusks, Fossil Fragments; Calcified fossil mold are abundant. Very fossiliferous interval. 64'-66' had poor recovery.
66 - 68 ft	Grainstone; Yellowish Gray (5Y 8/1); 60% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 90% Allochemical Constituents; Grain Size: Fine; Range: Fine to Coarse; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-3%, Calcite-2%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Coral, Benthic Foraminifera, Miliolids, Fossil Fragments; More fossiliferous than previous interval. Calcified fossil molds are abundant.
68 - 70 ft	Packstone; Yellowish Gray (5Y 8/1); 45% Porosity: Moldic, Pinpoint; Grain Type: Calcilutite, Pellet; 50% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Moderate Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Calcite-<1%, Shell-<1%; Other Features: Calcareous, Fossiliferous; General Fossils: Bryozoa, Coral, Benthic Foraminifera, Miliolids, Fossil Fragments; Less fossiliferous than previous interval. Less calcified fossil molds than previous interval. Of fossils present, Scleractinian coral is most abundant.
70 - 72 ft	Silt-Size Dolomite; Grayish Orange (10YR 7/4); 40% Porosity: Pinpoint; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Very Fine; Range: Very Fine to Fine; Moderate Induration; Cement Type: Dolomite; Accessory Minerals: Quartz Sand-<1%, Heavy Minerals-<1%; General Fossils: No Fossils; This interval marks the first appearance of silt-sized dolomite. Nor fossils present. Trace amounts of chalcopyrite present.
72 - 74 ft	Silt-Size Dolomite; Grayish Orange (10YR 7/4); 40% Porosity: Pinpoint; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Very Fine; Range: Very Fine to Fine; Good Induration; Cement Type: Dolomite; Accessory Minerals: Quartz Sand-<1%, Heavy Minerals-<1%; General Fossils: No Fossils; This interval is more indurated than the previous interval. No fossils present. Trace amounts of chalcopyrite present.
74 - 76 ft	Silt-Size Dolomite; Grayish Orange (10YR 7/4); 40% Porosity: Pinpoint; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Very Fine; Range: Very Fine to Fine; Good Induration; Cement Type: Dolomite; Accessory Minerals: Quartz Sand-<1%, Heavy Minerals-<1%; General Fossils: No Fossils; Same as above interval.
76 - 78 ft	Silt-Size Dolomite; Grayish Orange (10YR 7/4); 40% Porosity: Pinpoint, Moldic; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Very Fine; Range: Very Fine to Fine; Good Induration; Cement Type: Dolomite; Accessory Minerals: Heavy Minerals-<1%; General Fossils: Fossil Fragments, Fossil Molds; More vuggy and moldic than previous intervals. Trace chalcopyrite present throughout interval.
78 - 80 ft	Silt-Size Dolomite; Grayish Orange (10YR 7/4); 40% Porosity: Pinpoint, Moldic; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Very Fine; Range: Very Fine to Fine; Good Induration; Cement Type: Dolomite; Other Features: Fossiliferous; General Fossils: Bryozoa, Mollusks, Fossil Fragments, Fossil Molds; More vuggy and moldic than previous interval. 78'-80' consists of ~85-90% recovery.
80 - 82 ft	Dolostone; Grayish Orange (10YR 7/4); 30% Porosity: Moldic, Pinpoint; Medium (10-50%) Altered; Subhedral Crystals; Grain Size: Very Fine; Range: Very Fine to Fine; Good Induration; Cement Type: Dolomite; Other Features: Fossiliferous; General Fossils: Bryozoa, Mollusks, Fossil Fragments, Fossil Molds; First appearance of dolostone thus far. Fossil molds are abundant. 80'-81' is poor induration where as 81'-82' is good induration.
82 - 84 ft	Dolostone; Grayish Orange (10YR 7/4); 30% Porosity: Moldic, Pinpoint; Medium (10-50%) Altered; Subhedral Crystals; Grain Size: Very Fine; Range: Very Fine to Fine; Good Induration; Cement Type: Dolomite; Other Features: Fossiliferous; General Fossils: Bryozoa, Mollusks, Fossil Fragments, Fossil Molds; Very fossiliferous interval. Bryozoans and gastropods are abundant but heavily fragmented.
84 - 86 ft	Silt-Size Dolomite; Grayish Orange (10YR 7/4); 40% Porosity: Moldic, Pinpoint; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Fine; Range: Fine to Very Fine; Moderate Induration; Cement Type: Dolomite; General Fossils: Fossil Fragments; Marks a change back to silt-sized dolomite from dolostone. Small fractured/fragmented fossils present such as bryozoans and gastropods.
86 - 88 ft	Silt-Size Dolomite; Grayish Orange (10YR 7/4); 35% Porosity: Moldic, Pinpoint; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Fine; Range: Fine to Very Fine; Moderate Induration; Cement Type: Dolomite; General Fossils: Fossil Fragments; 86'-88' consists of only ~80% recovery. 86'-87.5' is silt-sized dolomite but 87.5'-88' is well indurated dolostone.
88 - 90 ft	Dolostone; Grayish Orange (10YR 7/4); 30% Porosity: Moldic, Pinpoint; Medium (10-50%) Altered; Subhedral Crystals; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Dolomite; General Fossils: Fossil Fragments; Minor fossil fragments present consisting of gastropods. 89.5'-90' consists of dolostone with large vugs.

90 - 92 ft	Dolostone; Grayish Orange (10YR 7/4); 30% Porosity: Pinpoint, Moldic; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Fine; Range: Fine to Medium; Good Induration; Cement Type: Dolomite; Other Features: Fossiliferous; General Fossils: Echinoid, Mollusks, Fossil Fragments, Fossil Molds; Throughout 90'-92' interval fossil abundance varies. Pinpoint vug-rich interval.
92 - 94 ft	Dolostone; Grayish Orange (10YR 7/4); 35% Porosity: Pinpoint, Moldic; Low (0-10%) Altered; Subhedral Crystals; Grain Size: Fine; Range: Fine to Medium; Good Induration; Cement Type: Dolomite; Other Features: Fossiliferous, Sucrosic; General Fossils: Bryozoa, Mollusks, Fossil Fragments, Fossil Molds; Less fossiliferous than previous interval.
94 - 96 ft	Dolostone; Grayish Orange (10YR 7/4); 55% Porosity: Moldic, Vugular; Medium (10-50%) Altered; Subhedral Crystals; Grain Size: Medium; Range: Fine to Medium; Good Induration; Cement Type: Dolomite; Other Features: Fossiliferous, Sucrosic; General Fossils: Bryozoa, Mollusks, Fossil Fragments, Fossil Molds; Interval consists of large vugs (~1/2") and sucrosic cavaties.
96 - 98 ft	Dolostone; Grayish Orange (10YR 7/4); 45% Porosity: Moldic, Pinpoint; Medium (10-50%) Altered; Subhedral Crystals; Grain Size: Medium; Range: Fine to Medium; Good Induration; Cement Type: Dolomite; Other Features: Fossiliferous; General Fossils: Bryozoa, Miliolids, Mollusks, Fossil Fragments, Fossil Molds; Interval becomes more vuggy towards bottom. Miliolids are abundant.
98 - 100 ft	Dolostone; Grayish Orange (10YR 7/4); 40% Porosity: Moldic, Pinpoint; Medium (10-50%) Altered; Subhedral Crystals; Grain Size: Medium; Range: Fine to Medium; Good Induration; Cement Type: Dolomite; Other Features: Fossiliferous; General Fossils: Bryozoa, Miliolids, Mollusks, Fossil Fragments, Fossil Molds; Only 50% recovery for this interval. Fossil molds and fragments are abundant.
100 - 102 ft	Dolostone; Dark Yellowish Orange (10YR 6/6); 30% Porosity: Moldic, Pinpoint; Medium (10-50%) Altered; Subhedral Crystals; Grain Size: Medium; Range: Fine to Medium; Good Induration; Cement Type: Dolomite; Other Features: Sucrosic, Fossiliferous; General Fossils: Fossil Fragments, Fossil Molds; Darker in color than previous intervals. Also more sucrosic than previous intervals.
102 - 104 ft	Packstone; Very Light Orange (10YR 8/2); 30% Porosity: Moldic, Pinpoint; Grain Type: Biogenic, Pellet; 70% Allochemical Constituents; Grain Size: Medium; Range: Fine to Medium; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Organics-<1%, Heavy Minerals-<1%; Other Features: Fossiliferous; General Fossils: Bryozoa, Miliolids, Mollusks, Fossil Fragments, Fossil Molds; Slightly lighter in color than previous interval. Very fossiliferous interval. Marks change to packstone from dolostone.
104 - 106 ft	Packstone; Very Light Orange (10YR 8/2); 40% Porosity: Moldic, Pinpoint; Grain Type: Biogenic, Pellet; 70% Allochemical Constituents; Grain Size: Medium; Range: Fine to Medium; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Organics-<1%, Heavy Minerals-<1%; Same as above. Trace chalcopyrite present.
106 - 108 ft	Wackestone; Very Light Orange (10YR 8/2); 40% Porosity: Moldic, Pinpoint; Grain Type: Biogenic, Pellet; 50% Allochemical Constituents; Grain Size: Medium; Range: Fine to Medium; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Organics-<1%, Heavy Minerals-<1%; Other Features: Fossiliferous; General Fossils: Bryozoa, Miliolids, Mollusks, Fossil Fragments, Fossil Molds; Less allochems present in this interval. Trace chalcopyrite present. Less abundant fossil molds and fragments than previous intervals.
108 - 110 ft	Wackestone; Yellowish Gray (5Y 7/2); 40% Porosity: Pinpoint; Grain Type: Biogenic, Calcilutite; 15% Allochemical Constituents; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Calcilutite Matrix; Other Features: Fossiliferous; General Fossils: Bryozoa, Miliolids, Fossil Fragments, Fossil Molds; Less fossil molds and fragments than previous interval. Also lighter in color than previous interval.
110 - 112 ft	Wackestone; Yellowish Gray (5Y 8/1); 10% Porosity: Moldic, Pinpoint; Grain Type: Biogenic, Calcilutite, Pellet; 15% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Shell-<1%, Organics-<1%; Other Features: Fossiliferous; General Fossils: Bryozoa, Coral, Miliolids, Fossil Fragments, Fossil Molds; This interval contains ~2" bryozoan mold but small molds are more abundant. Also small scleractinian coral is abundant throughout interval. Marks a distinct porosity change from previous intervals.
112 - 114 ft	Wackestone; Yellowish Gray (5Y 8/1); 10% Porosity: Pinpoint; Grain Type: Biogenic, Calcilutite, Pellet; 10% Allochemical Constituents; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Organics-<1%; General Fossils: Miliolids, Fossil Fragments, Fossil Molds; This interval contains far less (~10%) allochems than above interval. Organics are more abundant than previous interval. Fossil fragments are very small in size (~2mm).
114 - 116 ft	Mudstone; Yellowish Gray (5Y 8/1); 20% Porosity: Pinpoint; Grain Type: Biogenic, Calcilutite; 10% Allochemical Constituents; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Calcilutite Matrix; Sedimentary Structures: Laminated; Accessory Minerals: Organics-<1%, Shell-<1%; General Fossils: Miliolids, Fossil Fragments, Fossil Molds; Fossil fragments are far less abundant than previous interval. 115'-116' exhibits laminations.
116 - 118 ft	Mudstone; Yellowish Gray (5Y 8/1); 30% Porosity: Vugular; Grain Type: Biogenic, Calcilutite; 7% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Organics-<1%, Shell-<1%; General Fossils: Fossil Fragments, Fossil Molds; Fossil fragment content is same as above. Interval is vuggy throughout. 116'-116.5' shows slicken lines possibly from a subsidence feature.

118 - 120 ft	Mudstone; Yellowish Gray (5Y 8/1); 30% Porosity: Pinpoint; Grain Type: Biogenic, Calcilutite; 10% Allochemical Constituents; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Organics-<1%, Shell-<1%; General Fossils: Bryozoa, Miliolids, Fossil Fragments, Fossil Molds; First appearance of bryozoan since 112'-114' interval. More miliolids present than previous interval.
120 - 122 ft	Wackestone; Yellowish Gray (5Y 8/1); 15% Porosity: Pinpoint; Grain Type: Biogenic, Calcilutite, Pellet; 20% Allochemical Constituents; Grain Size: Fine; Range: Fine to Medium; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Organics-<1%, Shell-<1%; General Fossils: Bryozoa, Miliolids, Fossil Fragments, Fossil Molds; Fossil content is far more abundant than previous interval.
122 - 124 ft	Wackestone; Yellowish Gray (5Y 8/1); 15% Porosity: Pinpoint; Grain Type: Biogenic, Calcilutite, Pellet; 20% Allochemical Constituents; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Calcilutite Matrix; Accessory Minerals: Organics-<1%, Shell-<1%; General Fossils: Bryozoa, Miliolids, Fossil Fragments, Fossil Molds; Less fossil content than previous interval. Dictyoconus americanus is present in this interval. *Index Fossils: Dictyoconus americanus*
124 - 126 ft	Dolostone; Very Light Orange (10YR 8/2); 10% Porosity: Pinpoint; Low (0-10%) Altered; Anhedral Crystals; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Dolomite; Accessory Minerals: Organics-<1%; General Fossils: Fossil Fragments; This interval is a dolostone interbed. 124'-124.5' is a mudstone with very low fossil content.
126 - 128 ft	Dolostone; Light Greenish Yellow (10Y 8/2); 10% Porosity: Pinpoint; Low (0-10%) Altered; Anhedral Crystals; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Dolomite; Accessory Minerals: Organics-<1%, Heavy Minerals-<1%, Calcite-<1%; General Fossils: Fossil Fragments, Fossil Molds; Dolostone interval with pinpoint vugs abundant at 126'.
128 - 130 ft	Dolostone; Light Greenish Yellow (10Y 8/2); 10% Porosity: Vugular; Low (0-10%) Altered; Anhedral Crystals; Grain Size: Fine; Range: Fine to Very Fine; Good Induration; Cement Type: Dolomite; Accessory Minerals: Organics-<1%, Heavy Minerals-<1%, Calcite-<1%; General Fossils: Miliolids, Fossil Fragments, Fossil Molds; This interval is more vuggy than interval above. Higher fossil content near 130'.

Appendix D. Correlation Chart



[Terms shown are for hydrogeologic units present within the Southwest Florida Water Management District]

[1] Arthur and others acknowledge existence of the middle confining unit I within the Southwest Florida Water Management but do not map it for Special Publication 68.

[2] The Avon Park high-permeability zone (SWFWMD fracture zone) crosses middle confining unit I in central Polk County; therefore, it occurs above the middle confining unit I in northern Polk and below the middle confining unit I in southern Polk.

Appendix E. Daily water levels recorded during exploratory core drilling and testing at the East Homosassa well site in Citrus County, Florida

Appendix F. Daily water levels recorded during exploratory core drilling and testing at the East Homosassa well site in Citrus County, Florida.

[MM/DD/YYYY, month/day/year; HH:MM, hour:minute; ft, feet; bls, below land surface; als, above land surface; btoc, below top of casing; NAVD 88, North American Veritcal Datum of 1988; --, not recorded]. Well locations are shown in figure 3 and the well as-built diagrams in appendix B.

Date (MM/DD/YYYY)	Time (HH:MM)	Deepest Casing Depth (ft bls)	Core Hole Total Depth (ft bls)	Average Open Hole Interval (ft bls)	Core Hole Water Level (ft btoc)	Core Hole Water Level (ft bls)	Water Level (ft NAVD88)	Comments
3/1/2016	8:30	25	31	28	2.22	1.02	1.38	Stick up: 1.20 ft. als
3/1/2016	12:00	30	40	35	5.03	3.0*	-0.6	Water level not stable during collection. Packer installed at 30 ft bls.
3/2/2016	8:30	50	60	55	2.26	1.06	1.34	
3/2/2016	10:10	50	60	55	2.92	0.97	1.43	Stick up: 1.95 ft als. Packer installed at 50 feet bls.
3/3/2016	9:00	85	90	87.5	3.17	1.25	1.15	Stick up: 1.92 ft. als
3/3/2016	11:42	90	100	95	4.08	1.25	1.15	Packer installed at 90 ft. bls.
3/4/2016	7:30	125	130	127.5	3.0	2.06*	0.34	No Packer in HQ, Rained last night. Drillers collected WLs at incorrect measuring point.
3/4/2016	11:03	120	130	125	4.64	1.56	0.84	Packer installed at 120 ft. bls. Stick up: 3.08 ft. als.
3/7/2016	---	---	---	---	3.25	1.38	1.02	Stick up: 1.87 ft. als.

* Data not included in Figure 5. Explanation given in comments column.

Appendix F. Water Quality Sample Data Acquistion Sheets for the East Homosassa well site in Citrus County, Florida

WATER QUALITY SAMPLE ACQUISITION

WQ No. 1

General Information

Wellsite East Homosassa
Well UFA
SID#
Date 2/29/2015
Time
Performed by MTG

Well Depth (ft bls) 20'
Casing (HW) Depth (ft bls) 15
Casing (HW) Diameter (in.)
Hole Diameter (in.) 3
Packed Interval (ft-ft bls)
Packed Interval (m-m bls)
Initial Test Interval WL (ft bls)
Initial Annulus WL (ft bls)

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1		g/ft	X		ft (interval)	=	39	gallons
2		g/ft	X		ft (interval)	=		gallons

TOTAL PURGE VOLUME (one) = gallons

Pump Method 3" submersible
Airline Length feet
Discharge Rate (gpm) 26 gpm
Pump Time / Volume minutes **X THREE =** minutes
Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer
Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Multimeter Serial # WQMP 7

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
11:41	681	22.68	7.10
11:45	688	22.75	7.13
11:51	683	22.57	7.22

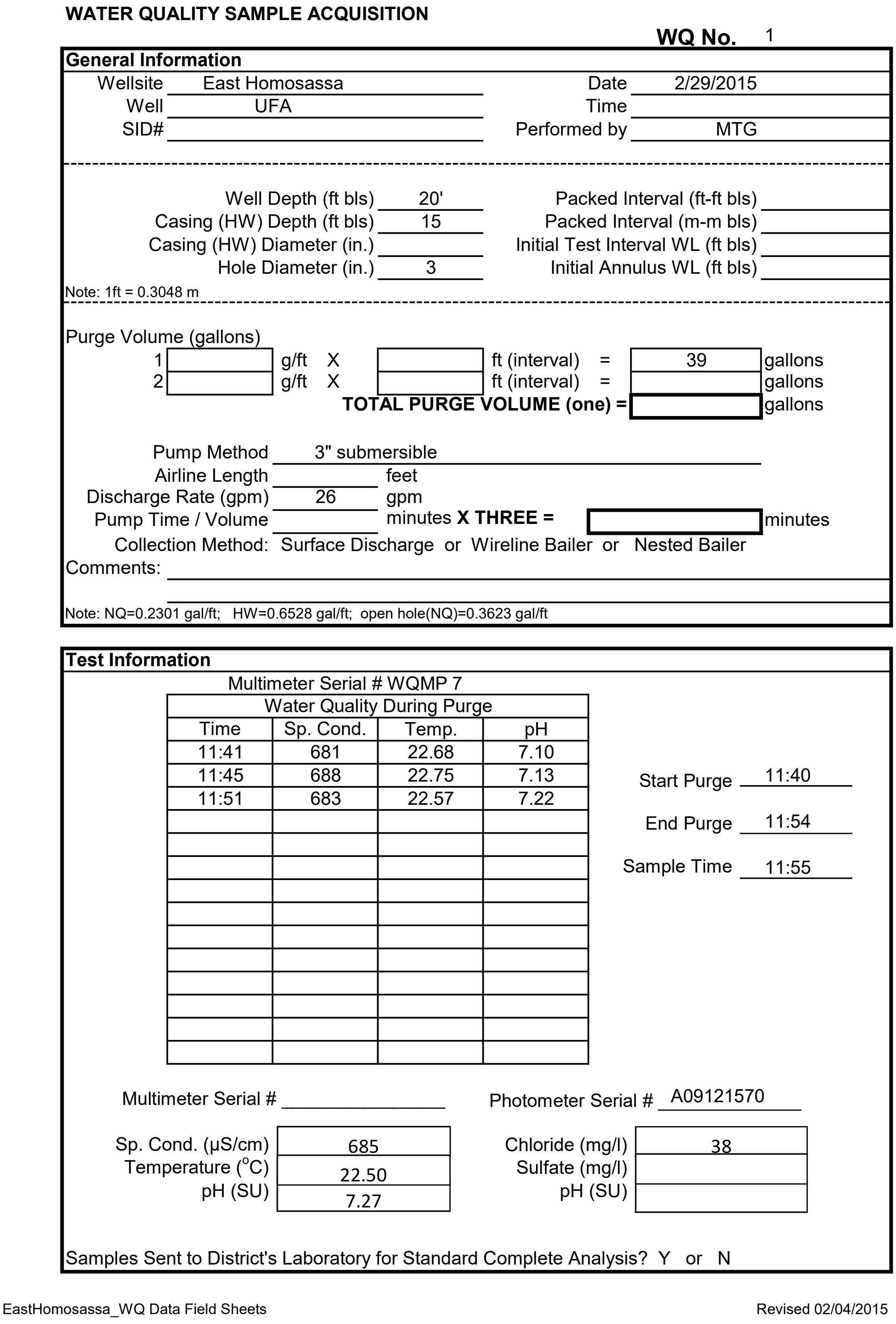
Start Purge 11:40
End Purge 11:54
Sample Time 11:55

No lab samples collected. Field samples only.

Multimeter Serial #
Photometer Serial # A09121570

Sp. Cond. (µS/cm)	685	Chloride (mg/l)	38
Temperature (^{o}C)	22.50	Sulfate (mg/l)	
pH (SU)	7.27	pH (SU)	

Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N



WATER QUALITY SAMPLE ACQUISITION

WQ No. 1

General Information

Wellsite East Homosassa
Date 2/29/2015
Well UFA
Time
SID#
Performed by MTG

Well Depth (ft bls) 20'
Packed Interval (ft-ft bls)
Casing (HW) Depth (ft bls) 15
Packed Interval (m-m bls)
Casing (HW) Diameter (in.)
Initial Test Interval WL (ft bls)
Hole Diameter (in.) 3
Initial Annulus WL (ft bls)

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1 ☐ g/ft X ☐ ft (interval) = 39 gallons
2 ☐ g/ft X ☐ ft (interval) = ☐ gallons
TOTAL PURGE VOLUME (one) = ☐ gallons

Pump Method 3" submersible
Airline Length feet
Discharge Rate (gpm) 26 gpm
Pump Time / Volume minutes **X THREE =** ☐ minutes
Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer
Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Multimeter Serial # WQMP 7

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
11:41	681	22.68	7.10
11:45	688	22.75	7.13
11:51	683	22.57	7.22

Start Purge 11:40
End Purge 11:54
Sample Time 11:55

Multimeter Serial #
Photometer Serial # A09121570

Sp. Cond. (µS/cm)	685	Chloride (mg/l)	38
Temperature (^{o}C)	22.50	Sulfate (mg/l)	
pH (SU)	7.27	pH (SU)	

Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N

EastHomosassa_WQ Data Field Sheets
Revised 02/04/2015

WATER QUALITY SAMPLE ACQUISITION

WQ No. 2

General Information

Wellsite East Homosassa

Date 3/1/2016

Well UFA SW Interface

Time

SID# 3654

Performed by MTG

Well Depth (ft bls) 40

Packed Interval (ft-ft bls) 30-40

Casing (HQ) Depth (ft bls) 30

Packed Interval (m-m bls) 9-12

Casing (HW) Diameter (in.)

Initial Test Interval WL (ft bls) 3.0

Hole Diameter (in.) 3.5

Initial Annulus WL (ft bls)

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.65	g/ft	X	10	ft (interval) =	6	gallons
2		g/ft	X		ft (interval) =		gallons
					TOTAL PURGE VOLUME (one) =	6	gallons

Pump Method Submersible 3 volume x 6 = 18 gallons

Airline Length -- feet

Discharge Rate (gpm) 28 gpm

Pump Time / Volume minutes **X THREE =** <1 minutes

Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer

Comments: Packer installed at 30 ft bls

TOC = 2.03' als. Packer installed w/ 350 psi

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Multimeter Serial # WQMP 7

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
12:04	706	22.15	7.16
12:07	709	22.18	7.16
12:09	707	22.20	7.16

Start Purge 12:00

End Purge 12:10

Sample Time 12:10

Multimeter Serial # WQMP #7

Photometer Serial # A09121570

Sp. Cond. (µS/cm)	709	Chloride (mg/l)	26.5
Temperature (^{o}C)	22.17	Sulfate (mg/l)	9
pH (SU)	7.17	pH (SU)	

Samples Sent to District's Laboratory for Standard Complete Analysis? [✓ Y] or N

WATER QUALITY SAMPLE ACQUISITION

WQ No. 3

General Information

Wellsite East Homosassa
Date 3/1/2016
Well UFA SW Interface
Time
SID#
Performed by MTG

HQ casing @ 9" = 0.75
Well Depth (ft bls) 60
Packed Interval (ft-ft bls) 50-60
Casing (HW) Depth (ft bls) 50
Packed Interval (m-m bls) 15-18
Casing (HQ) Diameter (in.)
Initial Test Interval WL (ft bls) 0.97
Hole Diameter (in.)
Initial Annulus WL (ft bls)

Note: 1ft = 0.3048 m

Purge Volume (gallons)

Open Hole 1	0.65	g/ft	X	10	ft (interval)	=	7	gallons
HQ 2	0.4	g/ft	X	50	ft (interval)	=	20	gallons
					TOTAL PURGE VOLUME (one) =		27	gallons

Pump Method Submersible 81 gallons total 3 volume
Airline Length -- feet
Discharge Rate (gpm) 35 gpm
Pump Time / Volume 2.5 minutes **X THREE =** 8 minutes
Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer
Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Multimeter Serial # WQMP 7

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
10:12	709	22.23	6.99
10:17	709	22.24	7.12
10:22	709	22.26	7.14
10:25	708	22.25	7.17

Start Purge 10:10
End Purge 10:25
Sample Time --

*Did not collect sample

Multimeter Serial # ________________
Photometer Serial # ________________

Sp. Cond. (μS/cm)		Chloride (mg/l)	
Temperature (^{o}C)		Sulfate (mg/l)	
pH (SU)		pH (SU)	

Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N

No lab samples collected. Field samples only.

WATER QUALITY SAMPLE ACQUISITION

WQ No. 3

General Information

Wellsite East Homosassa
Well UFA SW Interface
SID#
Date 3/1/2016
Time
Performed by MTG

HQ casing @ 9" = 0.75

Well Depth (ft bls) 60
Casing (HW) Depth (ft bls) 50
Casing (HQ) Diameter (in.)
Hole Diameter (in.)
Packed Interval (ft-ft bls) 50-60
Packed Interval (m-m bls) 15-18
Initial Test Interval WL (ft bls) 0.97
Initial Annulus WL (ft bls)

Note: 1ft = 0.3048 m

Purge Volume (gallons)

Open Hole 1	0.65	g/ft	X	10	ft (interval)	=	7	gallons
HQ 2	0.4	g/ft	X	50	ft (interval)	=	20	gallons
					TOTAL PURGE VOLUME (one) =		27	gallons

Pump Method Submersible 81 gallons total 3 volume
Airline Length -- feet
Discharge Rate (gpm) 35 gpm
Pump Time / Volume 2.5 minutes **X THREE =** 8 minutes
Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer
Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Multimeter Serial # WQMP 7

Water Quality During Purge

Time	Sp. Cond.	Temp.	pH
10:12	709	22.23	6.99
10:17	709	22.24	7.12
10:22	709	22.26	7.14
10:25	708	22.25	7.17

Start Purge 10:10
End Purge 10:25
Sample Time --

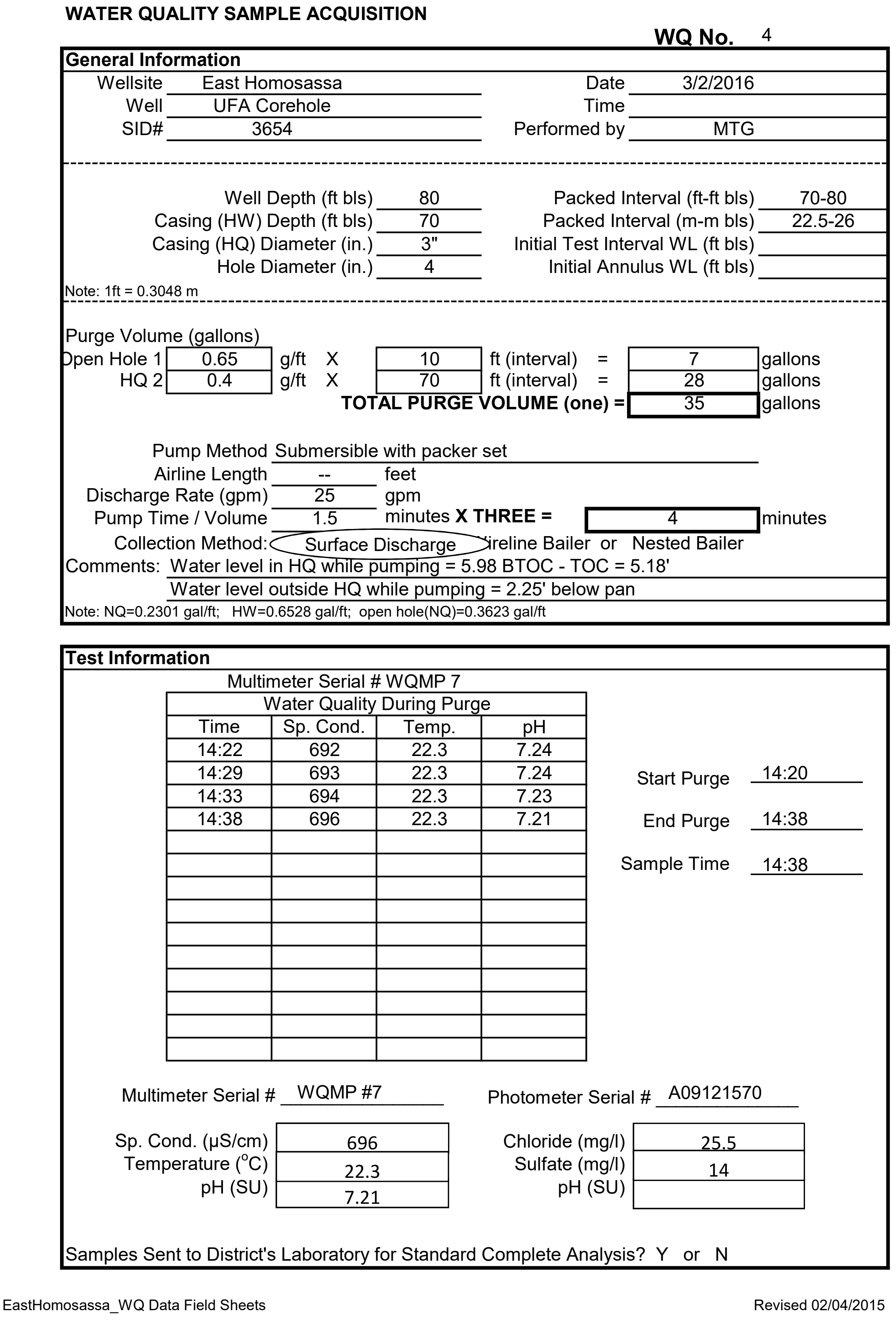
*Did not collect sample

Multimeter Serial #
Photometer Serial #

Sp. Cond. (μS/cm)
Temperature (^{o}C)
pH (SU)

Chloride (mg/l)
Sulfate (mg/l)
pH (SU)

Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N



WATER QUALITY SAMPLE ACQUISITION

WQ No. 4

General Information

Wellsite East Homosassa
Well UFA Corehole
SID# 3654
Date 3/2/2016
Time
Performed by MTG

Well Depth (ft bls) 80
Casing (HW) Depth (ft bls) 70
Casing (HQ) Diameter (in.) 3"
Hole Diameter (in.) 4
Packed Interval (ft-ft bls) 70-80
Packed Interval (m-m bls) 22.5-26
Initial Test Interval WL (ft bls)
Initial Annulus WL (ft bls)

Note: 1ft = 0.3048 m

Purge Volume (gallons)

Open Hole 1	0.65	g/ft	X	10	ft (interval)	=	7	gallons
HQ 2	0.4	g/ft	X	70	ft (interval)	=	28	gallons
					TOTAL PURGE VOLUME (one) =		35	gallons

Pump Method Submersible with packer set
Airline Length -- feet
Discharge Rate (gpm) 25 gpm
Pump Time / Volume 1.5 minutes **X THREE =** 4 minutes
Collection Method: [✓ Surface Discharge] ireline Bailer or Nested Bailer
Comments: Water level in HQ while pumping = 5.98 BTOC - TOC = 5.18'
Water level outside HQ while pumping = 2.25' below pan

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Multimeter Serial # WQMP 7

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
14:22	692	22.3	7.24
14:29	693	22.3	7.24
14:33	694	22.3	7.23
14:38	696	22.3	7.21

Start Purge 14:20
End Purge 14:38
Sample Time 14:38

Multimeter Serial # WQMP #7
Photometer Serial # A09121570

Sp. Cond. (µS/cm)	696	Chloride (mg/l)	25.5
Temperature (^{o}C)	22.3	Sulfate (mg/l)	14
pH (SU)	7.21	pH (SU)	

Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N

EastHomosassa_WQ Data Field Sheets
Revised 02/04/2015

WATER QUALITY SAMPLE ACQUISITION

WQ No. 5

General Information

Wellsite East Homosassa
Date 3/3/2016
Well UFA Corehole
Time
SID# 3654
Performed by MTG

Well Depth (ft bls) 100
Casing (HW) Depth (ft bls) 90
Casing (HQ) Diameter (in.) 3"
Hole Diameter (in.) 4"
Packed Interval (ft-ft bls) 90-100
Packed Interval (m-m bls) 29-32
Initial Test Interval WL (ft bls) 1.25
Initial Annulus WL (ft bls)

Note: 1ft = 0.3048 m

Purge Volume (gallons)

Open Hole 1	0.65	g/ft	X	10	ft (interval)	=	7	gallons
2	0.4	g/ft	X	90	ft (interval)	=	36	gallons
					TOTAL PURGE VOLUME (one) =		43	gallons

Pump Method Submersible
Airline Length -- feet
Discharge Rate (gpm) 31 gpm
Pump Time / Volume 43/31 minutes **X THREE =** 4 minutes
Collection Method: [✓ Surface Discharge] Wireline Bailer or Nested Bailer
Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Multimeter Serial # WQMP 7

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
12:00	695	22.14	7.18
12:03	694	22.21	7.22
12:06	691	22.26	7.23

Start Purge 11:56
End Purge
Sample Time 12:07

Multimeter Serial # WQMP #7
Photometer Serial #

Sp. Cond. (μS/cm)	687	Chloride (mg/l)	26
Temperature (^{o}C)	22.24	Sulfate (mg/l)	
pH (SU)	7.22	pH (SU)	

Samples Sent to District's Laboratory for Standard Complete Analysis? [✓ Y] or N

WATER QUALITY SAMPLE ACQUISITION

WQ No. 6

General Information

Wellsite: East Homosassa

Well: UFA Corehole

SID#: 3654

Date: 3/4/016

Time:

Performed by: MTG

Well Depth (ft bls): 130

Casing (HW) Depth (ft bls): 120

Casing (HQ) Diameter (in.): 3

Hole Diameter (in.): 4

Packed Interval (ft-ft bls): 120-130

Packed Interval (m-m bls): 39-42

Initial Test Interval WL (ft bls):

Initial Annulus WL (ft bls):

Note: 1ft = 0.3048 m

Purge Volume (gallons)

Open Hole 1	0.65	g/ft	X	10	ft (interval)	=	7	gallons
Rods 2	0.4	g/ft	X	120	ft (interval)	=	48	gallons
					TOTAL PURGE VOLUME (one) =		55	gallons

Pump Method: Submersible

Airline Length: -- feet

Discharge Rate (gpm): 20 gpm

Pump Time / Volume: 3 minutes **X THREE =** 9 minutes

Collection Method: [✓ Surface Discharge] Wireline Bailer or Nested Bailer

Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Multimeter Serial # WQMP 7

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
11:27	9740	21.79	7.51
11:29	9766	22.44	7.49
11:31	9787	22.43	7.49
11:34	9783	22.39	7.50

Start Purge: 11:15

End Purge:

Sample Time: 11:36

Multimeter Serial #:

Photometer Serial #: 9300

Sp. Cond. (µS/cm)	9804	Chloride (mg/l)	4200
Temperature (°C)	22.4	Sulfate (mg/l)	195
pH (SU)	7.51	pH (SU)	

Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N

Appendix G. Water Quality Data for the Groundwater Quality Samples Collected at the East Homosassa well site in Citrus County, Florida

Table H1. Field analyses results of the water quality samples collected during core drilling and testing at the East Homosassa well site in Citrus County, Florida.

[No., Number; SID, site identification; MM/DD/YYYY, month/day/year; HH:MM, hour:minute; ft, feet; bls, below land surface; --, no data; °C, degrees Celsius; SU, standard units; μmhos/cm, micromhos per centimeter]

Water Quality Sample No.	SID	Date (MM/DD/YYYY)	Time (HH:MM)	Sample Interval (ft bls)	Temperature (°C)	pH (SU)	Specific Conductance (μmhos/cm)	Comments
1	863761	3/1/2016	13:50	40-50	22	7.6	696	Airlifting
2	863761	3/2/2016	12:00	60-70	21.9	7.8	661	Airlifting
3	863761	3/2/2016	13:45	70-80	21.8	--	657	Airlifting
4	863761	3/2/2016	--	70-80	22.06	7.27	686	Submersible pump without packer
5	863761	3/2/2016	--	70-80	22.1	7.24	687	Submersible pump without packer
6	863761	3/3/2016	9:04	85-90	21.14	7.17	707	Submersible pump without packer
7	863761	3/3/2016	--	97-100	21.6	--	689	Airlifting after coring 90-100 ft bls
8	863761	3/4/2016	--	120-130	21.7	7.4	9,293	
9	863761	3/4/2016	--	--	20.25	--	246	Specific conductance after potable water added
10	863761	3/15/2016	--	120-132	22.75	7.7	12,487	Airlifting through rods installed in 4-inch casing (0-120 ft bls). Open hole 120-132 ft bls.
11	863761	3/15/2016	--	120-132	22.32	7.7	12,845	Airlifting

Table H2. Laboratory analyses results of the water quality samples collected during core drilling and testing at the

[SID, site identification; MM/DD/YYYY, month/day/year; HH:MM, hour:minute; ft, feet; bls, below land surface; SU, standard units; µmhos/cm, sodium; K^{1+}, potassium; Fe^{2+}, iron; Sr^{2+}, strontium; Si, silica; SiO_2, silicon dioxide; $CaCO_3$, calcium carbonate]

							MAJOR ANIONS		
Water Quality Sample Number	**SID**	**Date (MM/DD/YYYY)**	**Time (HH:MM)**	**Sample Interval (ft bls)**	**pH (SU) (N1)**	**Specific Conductance (µmhos/cm) (N1)**	**Cl^{1-} (mg/L)**	**SO_4^{2-} (mg/L)**	**HCO_3^{1-} (mg/L)**
1	863761	3/1/2016	12:10	30-40	8.15	702	77.6	6.6	244.6
2	863761	3/2/2016	14:38	70-80	8.18	693	84.4	3.9	228.1
3	863761	3/3/2016	12:07	90-100	8.19	687	84.1	1.8	227.2
4	863761	3/4/2016	11:36	120-130	8.11	9,670	3,060	504	154.4

[U] The ion was analyzed for but not detected. Value is reported as the method detection limit.

[I] Value is between the method detection limit and the laboratory practical quantitation limit, which is approximately four times the detection limit.

[N1] Test is not NELAC certified by this laboratory. Certification was not requested.

[Q] Sample held beyond holding time.

Table H3. The equivalent weight and percent equivalent weight for select ions and the water type for water quality

[ft, feet; bls, below land surface; No., number; meq/L, milliequivalent per Liter; mol/L, mol per Liter; %, percent; Cl^{1-}, chloride; SO_4^{2-}, sulfate; HCO_3^{1-},

		CATIONS							
		Ca^{2+}		**Mg^{2+}**		**Na^{1+}**		**K^{1+}**	
Water Quality Sample No.	**Sample Interval (ft bls)**	**meq/L**	**mol/L**	**meq/L**	**mol/L**	**meq/L**	**mol/L**	**meq/L**	**mol/L**
2	30-40	4.52	2.26E-03	0.85	4.24E-04	1.72	1.72E-03	0.03	3.33E-05
4	70-80	4.14	2.07E-03	0.98	4.90E-04	1.86	1.86E-03	0.03	3.33E-05
5	90-100	3.78	1.89E-03	1	4.98E-04	1.93	1.93E-03	0.03	3.40E-05
6	120-130	13.22	6.61E-03	17.28	8.64E-03	65.69	6.57E-02	0.64	6.40E-04

East Homosassa well site in Citrus County, Florida.

micromhos per centimeter; mg/L, milligrams per Liter; Cl^{1-}, chloride; SO_4^{2-}, sulfate; HCO_3^{1-}, bicarbonate; Ca^{2+}, calcium; Mg^{2+}, magnesium; Na^{1+},

MAJOR CATIONS									
Ca^{2+} (mg/L)	Mg^{2+} (mg/L)	Na^{1+} (mg/L)	K^{1+} (mg/L)	Fe^{2+} (µg/L)	Sr^{2+} (mg/L) (N1)	Si as SiO2 (mg/L) (N1)	Total Dissolved Solids (mg/L)	Total Alkalinity $CaCO_3$ (mg/L)	Comments
90.6	10.3	39.6	1.3	261	0.13	7.7	405	244.6	Surface discharge using 3-inch submersible pump
82.9	11.9	42.7	1.3	974	0.12	8.3	393	228.1	Surface discharge using 3-inch submersible pump
75.7	12.1	44.3	1.33	1,190	0.1	8.6	398	227.2	Surface discharge using 3-inch submersible pump
265	210	1,510	25	209	2.77	10.2	5,750	154.4	Surface discharge using 3-inch submersible pump

samples collected at the East Homosassa well site in Citrus County, Florida.

bicarbonate; Ca^{2+}, calcium; Mg^{2+}, magnesium; Na^{1+}, sodium; K^{1+}, potassium]

ANIONS						
HCO_3^{1-}		Cl^{1-}		SO_4^{2-}		
meq/L	mol/L	meq/L	mol/L	meq/L	mol/L	Water Type
4.01	**4.01E-03**	**2.19**	**2.19E-03**	**0.14**	**6.87E-05**	**Calcium Bicarbonate**
3.74	**3.74E-03**	**2.38**	**2.38E-03**	**0.08**	**4.06E-05**	**Calcium Bicarbonate**
3.72	**3.72E-03**	**2.37**	**2.37E-03**	**0.04**	**1.87E-05**	**Calcium Bicarbonate**
2.53	**2.53E-03**	**86.32**	**8.63E-02**	**10.49**	**5.25E-03**	**Sodium Chloride**

Table H4. Select molar ratios for water quality samples collected at the East Homosassa well site in Citrus County, Florida.

[No., number; ft, feet; bls, below land surface; Cl^{1-}, chloride; SO_4^{2-}, sulfate; Ca^{2+}, calcium; HCO_3^{1-}, bicarbonate; Mg^{2+}, magnesium; Na^{1+}, sodium]. Total alkalinity is used as HCO_3^{1-} because CO_3^{2-} and H_2CO_3 are considered negligible in groundwaters with pH less than 8.3 standard units (SU) (Hem, 1985); See tables H1 and H2 for sample site identification (SID) numbers.

Water Quality Sample No.	Open Interval (ft bls)	Cl^{1+}-:SO_4^{2-}	Ca^{2+}:HCO_3^{1-}	SO_4^{2-}:HCO_3^{1-}	Ca^{2+}:Mg^{2+}	Cl^{1-}:HCO_3^{1-}	Na^{1+}:HCO_3^{1-}	Na^{1+}:Cl^{1-}
1	30-40	31.86	0.56	0.02	5.33	0.55	0.43	0.79
2	70-80	58.64	0.55	0.01	4.22	0.64	0.50	0.78
3	90-100	126.60	0.51	0.01	3.79	0.64	0.52	0.81
4	120-130	16.45	2.61	2.07	0.77	34.11	25.96	0.76

Southwest Florida
Water Management District